Wage

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Incentives

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Preface to the Second Edition

The sound fundamentals enumerated in the original text by Mr. Louden remain essential to the continuing successful operation of all incentive plans. The years following its publication provided many illustrations of this fact. A very high percentage of the emergency plans installed in those war years did not long survive the end of the war. Those that did, in general, were those in which the care suggested in the book was followed in their development.

The text has been revised at this time to provide:

1. An outline form that may be of aid in teaching this subject.
2. More recent history about the use of modern wage incentives, including progress in the types and extent of coverage.
3. Further consideration of the effects of the changing pattern of labor relations.
4. An expansion of the discussion of management's responsibilities.
5. Some clarification in the terminology used, in order to be more consistent with present day usage.
6. Additional consideration of methods of evaluating and revising incentive installations.
7. Some recognition of the progress made in the area of work measurement through the use of statistical method, predetermined time systems, and performance rating research.

I was most pleased for the opportunity to relieve Mr. Louden of some of the task of preparing this revision of his book. This has permitted me in a very small way to attempt to repay him for the invaluable inspiration, counsel, and guidance he gave so freely during all the years of our direct association.

We are indeed indebted to Dr. Walter L. Daykin for allowing us to reproduce his invaluable study, "Arbitrators' Determination of Management's Right to Manage," in Appendix A. Likewise we are indebted to Dr. Maurice L. Kilbridge for letting us use part of his dissertation to illustrate the use of a statistical method as a measure of effectiveness of incentive plans which is included as Appendix B.

Special thanks also go to Mrs. Hazel Hann for the patience and the meticulous care with which she assisted in preparing the manuscript.

J. WAYNE DEEGAN

Iowa City, Iowa
January, 1959

Preface to the First Edition

The prominent position occupied today by wage incentives as a means of increasing production for war has been viewed with mixed feelings by many of us who for a number of years have worked directly with their use and application.

Believing in incentives, we are pleased to see them being generally recognized and accepted again as a major tool of industrial management. Believing in them also causes us to fear greatly for them, in that their suddenly renewed wide popularity may once again bring on the mistakes and misuses that caused them once before to fall into great disfavor in the eyes of both management and labor.

In an effort to plead the cause of incentives by attempting to tell their story in a balanced manner, I have written this book. In doing so I have written primarily for the man of management and the man of labor rather than for the engineer. I want to tell these two groups as briefly and concisely as I can what incentives really are and what they can really do. In the understanding which management and labor have of their use and in their balanced perspective the success or failure of incentives lies.

I have endeavored to avoid excessive technical details without sacrificing clearness and understandability. Rather than review the many ramifications of various incentive plans and their uses I have chosen to

hew to a straight line, emphasizing policies, relationships, controls, and the like, which to my mind have been less understood and appreciated than the technical details of the various wage incentive plans.

Not only have I tried to place before management and labor what I believe to be, and have found to be, the proper bases and concepts of incentives, but I hope I have also armed the engineer who is responsible for this work in his company with arguments and data to support his stand for sound, well-designed incentive plans. In writing to both management and labor I have outlined a common ground or basis for the development and installation of incentive plans that will be acceptable to both and will permit their use, thus allowing both groups to reap their benefits. If I have accomplished these ends, I shall feel that I have achieved my purpose in preparing this book.

In fairness to my company, I wish to state that the content of this book represents the free thinking of the author and does not necessarily conform to the practice and policies of the Armstrong Cork Company.

As is any author of a book such as this, I am indebted to many friends and associates with whom I have worked and whom I have known through the years. I am particularly indebted to Mr. G. Donald Louden and to Mr. P. K. Shoemaker for their specific comments and criticism of the material presented. I am indebted also to Mr. Paul A. Cooper and Mr. J. W. Deegan for their assistance with the source material on which Chapters X and XI are based, and to Mr. W. L. Sybert and Mr. Deegan for their assistance in the preparation of the manuscript.

J. K. LOUDEN

Lancaster, Pennsylvania
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Contents

Wage Incentives

PART ONE

Wage Incentive Ideas and Plans

Wage administration consists of installing and maintaining a wage program with three objectives. These objectives are: to hire the kind of people needed, to keep them on the job, and to aid in keeping them productive.

Such a wage program requires among other things wages that are comparable (1) with those paid others within our organization, (2) with those in our community or area, and (3) with those in our own and competing industries.

No one so far has developed a real objective method of determining a "fair wage." Such a method would depend on a scientific valuation of the worth of the job. This possibility seems very remote. As a consequence the only basis for judgment of the "fair wage" is to make comparisons. Such comparisons are made at all levels in the industrial society on a more or less universal basis. It follows then that to be considered "fair" our wage structure must measure up when subjected to all three of the comparisons listed.

In addition to the comparisons which people make relative to the basic wages for a job are those they make in relation to the performance

of various individuals on the job. Since recognition of his personal contribution is of prime importance to the individual, any sound wage administration program must give consideration to incorporating this recognition into the wage structure.

The wage incentive idea is successful to a considerable extent because it is a means of recognizing these individual differences. There are many types of individual differences that might conceivably be considered in a wage program. These differences may be apparent in higher output, either of ideas or goods, or in terms of better quality or higher yields. Other factors of merit such as attendance might also be acknowledged.

Wage incentives to compensate for these differences would include small group incentives in addition to the individual production incentive. This might include profit sharing in those situations where it is easy for the individual to see his own contribution in terms of a direct relationship to the profit of the enterprise. Also included would be rewards for ideas, such as suggestion plans. Such plans are, however, beyond the scope of this book. To simplify the treatment here, we will be concerned only with direct incentives based on the productivity of an individual unit.

CHAPTER ONE

A Brief History of Wage Incentives

Their Inception

THE TAYLOR SYSTEM

The foundation of modern wage incentive plans and the techniques used in developing them were laid by Frederick W. Taylor at the Midvale Steel Company in the early 1880's. They grew out of his desire to overcome the "systematic soldiering" which he found there. This soldiering was an evil that was inherent in the practice of "bringing a number of men together on similar work and at a uniform rate of pay by the day."[1] Since all were paid the same, the poorest worker tended to establish the amount of output.

Taylor further found a more pernicious form of soldiering brought about by piece rate systems in effect at that time. These piece rates were set usually on the foreman's estimate. If excessive earnings were made, the rate was cut. Therefore there was constant conflict between management and workers. The workers attempted to gauge their work to earn as much as they could without getting the rate cut while the management tried to induce the workmen to increase their output as much as possible to obtain lower costs.

[1] F. B. Copley, *Frederick W. Taylor,* Vol. 1, Book III, Chapter 1, Harper & Brothers, New York, 1923, p. 208.

Taylor realized that the chief difficulty lay in the fact that no one knew what constituted a fair day's work. Therefore he set out to establish a method or system whereby piece rates could be based, not on their actual performance in the shop, but on facts as revealed by careful investigation. Thus was born Taylor's "scientific method in connection with management," which grew to be known as the Taylor System.[2]

Overdemand for the Taylor System Led to Misuse

The success which Taylor's work had and the publicity which it received caused it to be more and more sought after by companies throughout the country. The advent of the First World War, which just preceded Taylor's death in 1915, and the pressure for increased production created a demand for the services of his associates greater than they could meet.

This overdemand for the services of trained qualified men laid open the profession of industrial engineering, as it is now known, to the untrained opportunists, to "efficiency experts" with little if any qualifications, and to others whose prime motive was to cash in on this new profession.

Totally overlooked by these opportunists was the high significance of the relation between motion patterns and performance. It is somewhat incongruous that at this very stage of development the pioneers in the field of motion study had already made and reported some of their most significant findings. No one has contributed more to the basic understanding of work methods than Frank B. Gilbreth and Dr. Lillian M. Gilbreth. Their analytical techniques and terminology have provided the basis from which modern motion study has developed. The true significance of their work was, however, recognized by insufficient numbers of management people at this time and even less by the "experts."

COMMON FAILURES IN INCENTIVE ADMINISTRATION

Industry and industrial engineering have not yet recovered from the evils wrought during the years 1915 to 1930. The practices of this period have had such far-reaching effects and will continue to influence future thinking on the part of both management and labor to such a degree that it is advisable to consider at least the most common effects

[2] F. B. Copley, *Frederick W. Taylor,* Vol. 1, Book III, Chapter 1, Harper & Brothers, New York, 1923, p. 217.

here. The following are considered by many to be the greatest of these evils.

1. Failure to Have Supervision Play a Major Role in the Program and Failure to Train Supervisors in the Fundamentals of Industrial Engineering

To fail to recognize the fact that the foreman is the manager of his department seems inexcusable in the light of sound management thinking. Management must not fail to recognize that, if the foreman is not "sold" on the project, or does not understand it, his men will realize this fact and will be against it also. Nothing can wreck the morale of a department more than ignoring its supervisor or forcing something unknown upon him.

This failure frequently led to conflicts between the supervision and the people making the study. These conflicts usually resulted in loss of shop morale and led to such common beliefs as "the engineers are coming in to tell the foreman how to run his department."

2. Failure to Enlist Cooperation of Employees and to Gain Their Full Understanding and Confidence

This failure is as obviously unsound as failing to work with and for the foreman, and demonstrates a lack of concept of what constitutes sound employee relations. It probably grew primarily out of the incompleteness of techniques, lack of personal competency, and general unsureness on the part of the people making the installation. They wrapped themselves in a shroud of mystery and, with an airy "this is something you couldn't understand," sowed the seeds of bitter resistance and opposition to this work.

3. Failure to Recognize the Caliber of Men and the Competency Required to Perform This Work

The performance of industrial engineering functions by untrained or inadequately trained men is a fault that must be shared by both management and practicing engineers. The desire of management to get the job done at as low a first cost as possible, plus its own lack of knowledge of what was involved, was a major cause. The lack of truly competent engineers and the lack of college curricula designed specifically to train men for this work were other factors.

Fortunately management generally has come to realize the importance of this function and is now more willing to set it up properly and to staff it with competent people. Yet we have not, today, more than approached the point in our thinking where the preaching of the

doctrine of having sound competent engineers can be lessened. If any management is not willing to set up this industrial engineering function properly and man it with competent people, then it is not in itself ready for such a program and should not have it.

4. Failure to Establish Standard Procedures and Policies Governing Industrial Engineering

This includes not only the use and application of the techniques of industrial engineering but also the application of results obtained, such as a wage incentive plan. The establishment of standard techniques in a detailed manner for all engineers in a company is still not a common practice. Yet if uniformity of results is to be obtained, it is essential.

Written policies governing wage incentives were usually vague if existing at all. These problems were frequently left to the whims of the department heads and the heads of the payroll departments. The pattern followed was often one of inconsistency, with its resultant confusion and discontent. The content and form these policies governing incentive plans can take will be discussed at length in a later chapter.

5. Failure to Realize That Industrial Engineering Consists of More Than Taking Time Studies and Installing a Wage Incentive System

If one evil had to be selected as the worst, it would be hard to deny the place to this mistaken concept. The old practice of going into a department, taking the layout, methods, and equipment virtually as it was, then establishing standards for wage incentive purposes has been completely discredited. In such cases no organized effort was made to eliminate waste. No organized effort was made to standardize methods of performing work and then train the workers in those methods. Frequently no attention was given to the establishment of an equitable basic rate structure prior to the incentive installation. When base rates were already out of line, the addition of incentives many times made a bad situation worse.

The fact that the true purpose of a wage incentive plan is to sustain the goals reached through proper layouts, proper work methods, proper equipment, and well-trained employees was not recognized. Instead, the goal of increased production and lower costs was sought by setting standards on the jobs as they were found and then hoping that they would be attained by offering a financial incentive. Too often this system left the average worker with no device other than increased effort to meet these standards, which, in turn, led to discontent and opposition to incentives. Some workers, through their

own ingenuity, improved their work methods to the point where meeting the standard was no particular chore. The inequities in effort which resulted only intensified the opposition of those less ingenious. What a blind approach this was to the problem, but fortunately its practice is rapidly diminishing.

6. Failure to Guarantee Standards Once Established Against Change Unless There Is a Change in Method, Equipment, or Specification

This evil was rate cutting. As above-average workers forced their earnings beyond what was considered the top by the foreman or the plant management, the rate would be cut. This practice soon led to workers putting ceilings on their output in self-protection.

Even after rates were first guaranteed some guarantees were vague and meaningless. The policy on this point must be clear-cut and rigidly adhered to if it is going to be acceptable to the workers. The practice of making a minor change in method, and then materially changing the standard, is not acceptable. If any change is made that affects a standard, only that portion of the standard involved should be altered, and then only to the proper degree. If changes are made on any other basis, they should be made only with the full knowledge and agreement of the employees concerned.

7. Establishment of a Ceiling on Incentive Earnings Above Which an Employee Must Not Go or The Standard Will Be Cut

The only advantage this practice had over plain rate cutting was that it saved the employees the trouble of learning by trial and error what the ceiling was. In the light of modern knowledge it seems inconceivable that such short-sighted practices existed.

The only ceiling that should ever exist on a properly set standard is that of the best efforts of the highest skilled, most ideal worker on that job. There are exceptional workers who will exceed the highest expectations on earnings. Management must recognize them and consider itself blessed that they are on its payroll.

8. Failure to Analyze and Establish Standards for Materials and Spoilage

Failure to establish proper standards and controls over material usage as well as to establish the expected amount of spoilage led to confusion and strong differences of opinion. Often through excessive use of materials unusually high production could be obtained. Yet in many cases the value of the material used was greater than the cost of the labor involved. This same point held true for spoilage. Production

would go up, but the increase in spoilage more than offset the gains made. The attempt of management to remedy this omission after the installations were in often led to the charges of rate cutting.

9. Failure to Establish Rigid Specifications and Quality Standards

This is similar to the evil listed above. When proper quality standards were not clearly established, production increases were often obtained at the expense of quality. When attempts were made to overcome this lack, strong differences of opinion often arose as to what was the preinstallation quality, or what constituted acceptable quality. Here again it is essential that such problems be settled before the installation is made.

10. Failure to Maintain Properly and Regularly Measured Standards and Wage Incentive Installations Once They Are Established

The rigid maintenance of an incentive plan is essential if it is to be successful. It was once common practice to forget about an incentive plan after its initial installation, except for annual—or some other set period—check-ups. At these periodic intervals, attempts were made to take up all the slack that had occurred in the interim.

This meant that loose standards were tightened for no apparent reason other than that a date had been reached. The changed conditions that made the standard loose may have been in effect for months. It was very difficult to convince the average worker that the standard should be changed at that later date. The opposite situation of a standard no longer being adequate was also found. Thus the plan had become unbalanced and ill fitting, with all the problems of fair administration that such a situation involves.

No matter how carefully and completely the installation and all that went before are made, the conditions that exist at the time will not remain static. To keep everything in balance and to provide as high a degree of coverage as possible require that the installation be perpetually maintained. Every change in specification or method should be followed up immediately with the effect on existing standards measured. If it is a controllable change, its effect on standards and quality should be checked before it is made. The fine results of a good piece of work could soon be dissipated by the lack of proper maintenance with general dissatisfaction among the employees the probable result.

These evils and pitfalls that were once common take on special significance whenever demands for increased output overabsorb the market of trained industrial engineers. Companies which have not used incentives on any scale may attempt, at the same time, to make

use of incentives as production aids. It is wise that they consider well the results of ill-advised haste in the past.

Growth and Development of Wage Incentives

As incentives became more and more popular, various plans were offered to industry. These plans usually embodied some particular idea or feature that made them different from the others. During that period virtually all the emphasis was placed on the *plan* rather than the *foundation* upon which the plan rested. In the attempt to overcome the deficiencies of lack of motion study in the full sense, sound time study, and the like, complexities were introduced that tended to level off wide swings in earnings. The result was that under some of the plans few workmen could calculate their own earnings or understand how they were calculated. This condition did not aid their reception by the workers or the foremen.

Today, with our more advanced techniques and greater experience, the trend is to keep the plan itself as simple as possible and take care of the variables by measuring and controlling them. The majority of plans that were prominent twenty or thirty years ago are virtually non-existent today. However, some are still in use to a limited degree, and the principles involved in others have carried through to become integral parts of present practices. Piece rates in their various forms may still be the most common type of incentive plan. However, bonus plans using time standards rather than money standards are displacing them in many companies.

The early practice of having a very low guaranteed base rate when incentives were used, plus that of having a day work base rate and a lower incentive base rate for the same job, have generally disappeared as a result of legislation and sounder wage policies. The latter device was designed primarily to guard against excessively high earnings on poorly and inadequately set standards. Improved techniques and greater experience have removed any excuse for using such a protective device today.

To illustrate changes in thinking further, we can recall the day when the worker, at best, knew only vaguely what his earnings were until he received his pay. Today it is sound practice to post incentive earnings every day in the shop for all to see.

Depression Years Saw Abandonment of Incentive Plans. In the economic depression of the early 1930's there was a strong tendency in many industries to abandon incentive plans of all types and return to day work or some form of measured day work. The cause of this

reversal can be traced to a number of factors. The low volume of production in many industries made it very difficult to provide sufficient work to encourage the men to produce. Then, too, management was seeking every means to reduce overhead, and their incentive system and the people required to operate it were among the early victims in some companies. The added desire to spread the work and hold keymen often made incentive plans meaningless and apparently unprofitable to maintain.

In many cases a major factor in their elimination was the revolt of organized labor in its new-found strength against ill-designed and poorly administered incentive plans. This attitude made itself doubly felt when the depression was over and times were more normal. Many companies have yet to get incentives back on any scale, and the progress they have made has been slow and painful.

Looking back on the broad industrial picture, we see that the elimination of incentives in many companies could have been a blessing in disguise. It not only wiped the slate clean of hopelessly involved and inadequate incentive installations but it also forced many managements to alter materially their concepts and policies regarding incentive plans.

Progress During the War Years. The years from 1940 to 1946 again provided the proper climate for the rapid growth of a second generation of "efficiency experts." Many managements under the terrific pressures for production encountered in the wartime economy looked to wage incentives as a means of both increasing productivity and attracting scarce labor. Again, almost overnight, grocery clerks, shoe store salesmen, and other equally qualified individuals were given "shotgun training" in stop watch reading and sent out to set production standards. There seems no question that these wartime measures did increase production and were possibly justified for this reason.

No one can find fault with the basic principle of wartime wage incentives as it was stated by the War Production Board. That principle was, "If it can be shown that a ten per cent increase in production over *reasonable standards* [italics are the authors'] has been secured in a given plant, then the entire working force in that plant should receive a bonus of exactly ten per cent." In the illustration of what was meant by "reasonable standards" an example was given of the number of man-hours at *normal working speeds* [italics are the authors'] required to produce a specified number of bombers. If, during a working period, a number of bombers greater than that specified was produced utilizing the same number of man-hours, a bonus was to be paid to all workers in direct proportion to this increase in production.

As stated, no one can quarrel with that principle. But the question can and must be raised of how that "reasonable standard" is going to be established. The statement was made by Mr. Wilson that this overall plan "eliminates the time-taking technical task of setting up time study measurements for individual performance." On that basis, unless detailed standard data existed, and generally they did not, the reasonable standards had to be based on past performance, or the cursory judgment of an individual or group of individuals. Past experience had proved beyond the shadow of a doubt that *neither* of those methods provides an acceptable basis for the purpose of establishing work standards that would survive the tests imposed by wage incentive plans.

The expediencies of the moment fostered a rash of standards set on an arbitrary or bargaining basis. A plethora of plant-wide incentives based on such standards were established. Most such plans are now extinct. Since many of the plants were entirely devoted to war production, lasting harm from such sloppy methods may have been avoided in those cases. Most of the companies that tried such measures for production incentives in peacetime as well as wartime have since regretted their use.

In total the damage to the incentive idea was, however, less during these years than during the years 1910 to 1930. Several factors combined to make this so. These restraining factors were the War Labor Board, previous experience of management, and a somewhat greater supply of adequately trained and experienced industrial engineering personnel. The red tape required by the War Labor Board to secure approval and the Board's minimum requirements as to cost and production discouraged many plans which would otherwise have been established. In addition, the time required for approval considerably slowed the pace at which such installations could be made. Many mature managements, aided and bolstered by available trained engineers, restrained their organizations and further reduced the number of faulty installations.

Greater Acceptance of Incentives. Because of the positive effects on wages and productivity during this period, and in spite of the inadequacies of many installations, the idea of wage incentives was acceptable to the country as a whole. A Gallup Poll taken in 1947 showed that 59 per cent of the people approved of paying for work on a piecework basis, and 75 per cent agreed that incentives would increase productivity in most factories. Since that time further gains have been made. Some unions, once downright hostile, are taking new positions that vary from cooperative effort to at least a willingness to be shown.

One of the most concrete evidences of this growing approval on a country-wide basis occurred shortly after World War II when, for the first time in thirty years, the appropriations riders which had effectively prohibited the use of any time measuring devices for standard setting purposes in government installations were omitted. No such rider has since, to our knowledge, appeared on any federal legislation. In fact, many government agencies are now utilizing time standards to great advantage.

In times which are relatively prosperous we may expect this trend of increased acceptance to continue. During readjustment or recession periods opposition may generally be expected to develop.

EXTENT OF USE OF INCENTIVES

In one of the few attempts made to quantify the extent and trend of incentive coverage, Kilbridge[3] estimates that the general trend of employees working under incentive methods of wage payment in manufacturing industries has increased about 10 per cent in the past 25 years. He indicates the present coverage to be somewhere between 50 per cent and 60 per cent of the work in this category.

Because emphasis is now being given to the coverage of so-called "non-productive" work, this trend is likely to continue for some time to come.

Changing Nature of Productive Work. Continuing mechanization and automation of industry are unquestionably having an effect upon the nature of the wage incentive installation. As new automatic production equipment is installed, proportionately less manual labor is required to perform the so-called direct or production work. The output of goods is also becoming subject to more exact control, both of quality and of quantity, as the result of better instrumentation and control devices required for automation.

As plants become automated to the extent that most production workers are displaced, the importance of the maintenance and technician-type workers will become greatly accentuated. A continuing increase in the percentage of persons employed in the distribution process and other service occupations may likewise be expected. With a higher percentage of the nation's payroll being absorbed by maintenance and service work, which by nature is more complex and requires more thinking and less doing than the routine type of manufacturing operation, equitable incentive plans will become increasingly more difficult to develop and install.

[3] Maurice D. Kilbridge, *The Management of Wage Incentives*, Ph.D. Dissertation, State University of Iowa, Iowa City, 1954, p. 9.

All this has caused some managements to feel that wage incentives are no longer practical. Considerable success, however, has already been attained by many companies in the extension of incentives to cover this type of work, and if incentives are to continue to be a considerable factor in the encouragement of productive effort, more ingenuity and consideration of the individual's means of contribution is to be called for.

One of the pioneer installations in the area of maintenance incentives was made by Swift and Company, who established their first financial incentive plan for maintenance crews in 1926 at their Saint Paul, Minnesota plant. Reporting on their experiences in 1950, after 24 years of generally successful operation in providing wage incentives for the majority of maintenance workers involving, for example, as many as 20 crafts in one plant, H. J. Moore[4] said, "The plan has worked out pretty well for us. . . . We found that production increased from 65% to 120%. . . . It is my own opinion that [this] . . . type of direct application . . . could be used in most industries."

Since that time many additional successful installations for service-type occupations have been reported. These reports have included case examples of incentives for indirect workers,[5] inspectors,[6] warehousemen,[7] and cafeteria personnel,[8] as well as additional illustrations of maintenance[9] incentives.

This would indicate that although the possibility of obtaining a high per cent incentive coverage with standards routinely established on production of goods alone is passing, the necessary imagination and insight is available to provide equitable incentives for many occupations which traditionally have been considered non-incentive jobs. This assurance coupled with the basic soundness of the incentive idea makes it likely that some form of wage incentives based on individual performance will continue to play an important role in securing the optimum cooperation in industry.

[4] H. J. Moore, "Application of Direct Incentive to Maintenance Work," *Proceedings*, Fifth Annual Time Study and Methods Conference, sponsored by the Society for Advancement of Management *and* The American Society of Mechanical Engineers, 1950, pp. 94–101.

[5] E. A. Cyrol, "Measuring 'Indirect' Work by Time Study," *Mill and Factory*, December 1948.

[6] Wilmer C. Cooling, "Inspection Incentives for Higher Quality Work at Lower Cost," *Mill and Factory*, September 1952.

[7] Keith Boaz, "Incentives in the Warehouse," *Factory Management and Maintenance*, September 1953.

[8] E. C. Weirick, and G. S. MacKay, "Here's an Incentive Plan That Cuts Cafeteria Losses," *Factory Management and Maintenance*, November 1951.

[9] W. C. Cooling, "Maintenance Incentives are Practical—But," *Factory Management and Maintenance*, February 1954.

CHAPTER TWO

Fundamental Types of Wage Incentive Plans

TERMINOLOGY

One of the biggest difficulties to be overcome in any discussion of wage incentives is the lack of standardization of terms. This was conclusively demonstrated in the findings of the Society for Advancement of Management Committee on Rating Time Studies.[1] It was demonstrated by this study that

> the term "normal performance" is [generally] assigned an entirely arbitrary meaning which varies considerably among companies. Much closer agreement is obtained among companies when the "common denominator" chosen is the "allowed time for average of qualified incentive operators." This value can be obtained by dividing 480 minutes [the eight-hour working day] by the daily production expected of the average of qualified incentive operators.

The terminology in this book generally is based upon the *Glossary of Terms* developed by the Society for Advancement of Management National Research Committee.[2] To avoid the ambiguity of the use of

[1] *Manual of Performance Rating Time Values for Twenty-four Operations shown on Eight Reels of Motion Picture Film*, Society for Advancement of Management, New York, 1950, p. 3.

[2] *Glossary of Terms used in Methods, Time Study, and Wage Incentives*, published by the Society for Advancement of Management, New York, 1953.

such terms as "normal" or "standard," however, several additional reference terms are used in this discussion. They are defined as follows:

Incentive performance—the expected attainment of average of qualified incentive operators on an eight-hour day basis.[3]

Incentive time—the allowed time for average of qualified incentive operators.

Incentive index—the ratio of the actual performance to the expected incentive performance.

Incentive efficiency—incentive index multiplied by 100.

Incentor—an operator working at the incentive performance level.

REPRESENTATIVE PLANS

Many different types of wage incentive plans are in use today. When incentive plans first broke away from piecework systems there were many different types developed. In the light of the limited industrial engineering knowledge and practices of that time, attempts were made to control the many variables encountered through the type of plan. That meant that most of the plans were complex and difficult to understand and operate.

In recent years as industrial engineering practices became more complete, the trend has been away from the complex plans and toward the simpler, more understandable ones. This trend was brought about by two forces: one, the elimination of many variables and the establishment of controls over the remainder through careful analyses and studies, and, two, the desire to make the incentive plan understandable and therefore more acceptable to the employees. This trend is a laudable one and should be fostered. No incentive plan should be more complex than is necessary to include the factors that represent the production goals sought. These factors include increased production, material control, spoilage reduction, equipment utilization, and the like.

To include a description of even a majority of the incentive plans now in use would unnecessarily complicate our discussion. As stated, many plans once popular are now fading from the industrial scene and are losing their importance. That being so, let us then confine our discussion to the six types of plans which probably, at least in their

[3] *Manual of Performance Rating Time Values for Twenty-four Operations shown on Eight Reels of Motion Picture Film*, Society for Advancement of Management, New York, 1950, p. 31.

fundamentals, represent the vast majority of incentive plans now in force. They are:

1. Straight Piecework Plan.
2. The Standard Hour Plan.
3. The 50-50 Premium Bonus Plan (Halsey).
4. Point Plans Typified by the Bedaux System.
5. Measured Day Work Plan.
6. Incentive Performance Plans.

There are variations from the description we shall give of each of these plans. However, the variations usually represent personal ideas and are within the fundamental structure of the plans. Therefore, again for the sake of simplicity of discussion, we shall confine our consideration of these variations only to the more common ones.

1. Straight Piecework

This plan is more generally used than perhaps any other. Its chief characteristic is that all standards are expressed in terms of so much money for a given unit of production. The time standards developed by time studies are converted into money by applying the time allowed to perform the job against the hourly rate for that job. If the allowed time is expressed as incentive time, the hourly rate used is the hourly rate which the incentor is expected to earn. If the allowed time is expressed as a break-even time, the hourly rate used is the base rate for the job. The plan is easily understood by the workmen.

Since this is a Straight Piecework Plan the employee gets all that he earns. There are variations of this principle in the form of differential piece rates usually designed to encourage high productivity, but they do not commonly exist because of their complexity. This plan also provides for a constant unit cost once production exceeds the amount required to earn the guaranteed hourly base rate. This is advantageous from both a cost accounting and a budget standpoint.

Piecework has several disadvantages which are important and should be borne in mind. One is that it links the time study function irrevocably with the amount of money earned. This fact is not in keeping with the principle of dissociating the establishing of standards in the worker's mind from the amount of money he is paid to perform his job. It makes it very difficult for the engineer to convince the employee that he is not interested in how much money the employee is paid to do a job but only in measuring as accurately as he can the amount of work in the job. The amount of money paid for doing

the job is determined by job evaluation and the resultant establishment of a base rate structure, not by time study.

Another disadvantage is the vast amount of clerical work involved in changing all piece rates when the general wage scale is changed. Not only is this a big job from the standpoint of the number of rates to be changed, but the care required to prevent errors in calculating the new rates is a large factor. Then, too, the confusion that the new rates often cause in the minds of many workmen is time consuming for both the supervision and the engineers.

Piece rates do not lend themselves readily to group incentives where workmen with more than one base rate are involved. Under such a condition it is usually necessary to convert the total piece rate into percentages of the total that will be paid to each man, or to break the total rate down into its component parts. Piece rates are also more difficult to handle than time rates when there are such positive factors in the incentive as control of materials and the like. Under certain conditions control of material usage carries a greater weight than production. It is here that piece rates are awkward in their application.

Another very definite disadvantage is the fact that piece rates are strongly and deeply associated with past bad practices in the use of incentives. These past bad practices are the establishment of standards based on the foreman's estimate and rate cutting. Therefore, labor, from bitter experience, feels that it has reason to be suspicious of the Piecework System of wage payment. In line with this fear of rate cutting the engineer who has to work with a Piecework System finds it most difficult to adjust rates when there has been a change in the requirements of the job because of improved methods or the like. The standard is buried in the money rate and, when changed downward, is more likely to be construed as a cut in the rate than if the standard were expressed in terms of time rather than money.

Although this plan has been used more than any other, it is largely because it is the oldest type of wage incentive plan in use and was widely known before the other plans were developed. However, in our opinion, it is outmoded for the reasons given above and its use is diminishing.

2. Hundred Per Cent Incentive Plan or Standard Hour Plan

"This is an incentive plan in which the per cent performance over standard is rewarded by an equal per cent premium over base pay."[4] When the standard is expressed in standard hours per unit of produc-

[4] *Glossary of Terms used in Methods, Time Study, and Wage Incentives*, Society for Advancement of Management, New York, 1953.

tion, it is usually known as a Standard Hour or Allowed Hour Plan. Earnings are computed by multiplying standard hours produced by an hourly rate. The base rate earnings are guaranteed.

This plan began to achieve prominence when the estimating of production standards became more of an engineering function and less a matter of guessing. Standards began to be based on carefully made and analyzed time studies rather than on past averages and foreman's estimates.

The main feature of the plan is that the workers receive 100 per cent of the bonus earned. In this way it compares with Straight Piecework. In fact, the only major difference between Straight Piecework and the Standard Hour Plan is that under this latter plan the standards are expressed in time per unit of production rather than in money. In view of this fact the plan has none of the disadvantages of money rates and yet has all the advantages of Straight Piecework. Men who are used to figuring their rates in terms of money can easily make the transition to terms of time.

Although the standard is always expressed in terms of time, the earnings can be calculated either in terms of time saved or as a per cent efficiency. For example, when time saved is to be the basis, a standard is developed in the following manner. Suppose that in the best judgment of the time study analyst an "incentor," who is skilled in the work, physically and mentally suited for it, and working at a pace he can maintain day in and day out without injury to his health, can do the job in one minute. This incentor may in no sense be the average of the group or any individual in it, as they or he may not meet these requirements. Then, if it is the policy of the company to pay 25 per cent bonus to the workman who does the job in one minute, the time allowed would be 1.25 minutes. In other words, although the workman takes only one minute to do the work, he would be paid 1.25 minutes for it. It could be said further that, should he take 1.25 minutes, he would be breaking even from an incentive viewpoint. At that rate of output he would then be considered to be earning his base rate and would be qualified for the job.

If, on the other hand, it was felt desirable to use an incentive efficiency basis for the purpose of designating performance to determine the percentage of bonus earned, the plan would take the form of an Incentive Performance Plan described in Section 5 of this chapter.

For ease of understanding, expressing the standard in total time allowed, as described in the first example of calculation, is to be desired above the efficiency method. It is more easily understood by the employees and thus it is simpler for them to calculate their bonus

earnings. It has a further advantage in that the standard is given them in total time allowed, that is, the break-even point. They can then readily see that they are earning a bonus as they start to take less time than they are allowed by the standard. For ease of bonus calculations some engineers prefer to express the standard in decimal hours rather than in minutes. However, again, from the viewpoint of ease of understanding on the part of the workmen, minutes are preferable. It is a simple calculation for the payroll department to translate these into hours for their purposes.

The plan lends itself readily to the development of controls and efficiency measuring sticks. Since it provides for a constant unit cost once the break-even or 0 per cent bonus point is reached, it is desirable from a cost accounting and budget standpoint. In our opinion, this plan is the most desirable of those we are discussing. In our experience we have never found a situation wherein its fundamental principles would not apply equitably.

3. The 50-50 Premium Bonus Plan (Halsey)

This plan was developed by F. A. Halsey, who was either the first, or one of the first, to develop a modern type of incentive plan that broke from Straight Piecework. This plan was also one of the first to use a guaranteed base rate and to express standards in terms of time rather than money.

Since his standard times were usually set from past production records, he chose to divide the production time saved under these standards between the employee and the employer. As the division was usually equal, the plan became known as the 50-50 or Split Bonus Plan. Under modern practices, this basis of setting standards is not acceptable, and our opinion is here supported by experience. It leads to uneven requirements among jobs with resultant wide swings in earnings. Incidentally, the primary reason for splitting the time saved was that it tended to compensate for these wide swings.

The standard was developed by adding double the desired bonus to the estimated minimum time it was thought the operation required and then giving the employee half the bonus he earned. For example, if as in the explanation used in the Hour-for-Hour Plan discussion, the "incentive time" was one minute, then under the 50-50 Plan the standard would be 1.5 minutes rather than 1.25 minutes.

This feature of adding double the desired bonus and then giving the employee half of what he earned enabled the employee to earn some bonus at a relatively low efficiency performance, thus protecting him somewhat against standards that were estimated too low. Conversely,

it protected the company against excessive bonus earnings in the event that the standards were set so high that the increasingly diminishing returns to the worker did not encourage him to extend himself above a certain point, that point being the one at which he earned the expected per cent bonus, in this case 25 per cent. (See Figure 1, p. 30.)

With the advent of modern techniques and practices in time and motion study it is difficult to justify the use of a split plan such as this. It is hard to deny the advantages of starting the payment of bonus at a low percentage of efficiency from an employee acceptance viewpoint; nevertheless, if the basis of the plan is sound, then the use of such a device to gain acceptancy should not be required. This advantage is more than offset by the discouragement offered the worker to extend himself above the expected bonus earnings. Thus it encourages a ceiling on earnings well below the abilities of some of the workmen.

If the proponents of this plan are completely sincere in their justification of its use on the basis of its enabling the worker to earn bonus at a low percentage of efficiency, they could improve the reception of their stand by adopting the Standard-Hour principle above the expected bonus earning point or 25 per cent. (See Figure 1.) On this basis they could retain their objective of offering greater encouragement to the worker at low performance and obtain the desirable feature of providing maximum encouragement to the above-average worker by offering him 100 per cent of the bonus he would earn above the expected earnings point of 25 per cent.

Those who oppose the continued use of the 50-50 Plan today contend that it encourages inaccuracy in the establishment of standards, and is still used as a device to alleviate the degree of seriousness of those inaccurate standards. Another factor in this opposition is that, since bonus is paid at low efficiencies, unit labor costs may be increased at those levels, which is undesirable from a cost standpoint. A related feature of this plan is that it provides a varying unit labor cost at all points, which is also not desirable from a budget and cost viewpoint.

4. Point Plans Typified by the Bedaux System

This plan and its contemporaries were very popular with management during the 1920's. They emphasized the development of controls or efficiency measuring sticks as a major part of incentive plans. The introduction of cost controls as a feature of incentive plans was a major step forward in increasing their value and general usefulness to management. These plans also included other incidental features which were intended as refinements in the establishment of incentive systems.

For example, in the earlier days Bedaux engineers used as the unit

for expressing their standards the letter B. One B was equal to one minute. Today this term B has been generally discontinued and either straight time—usually minutes—is used or some coined term, such as "units." In its earlier applications the worker was paid 75 per cent of the bonus earned, the other 25 per cent going into a pool out of which a supervisor's bonus was paid. This practice has been almost entirely discontinued and today the worker is paid 100 per cent of the bonus he earns. Since the sharing feature has been eliminated, the relation of productivity to earnings is the same as for a standard hour plan.

Another feature of the plan was the establishing of 60 B's, units, or minutes per hour as an average worker's output and 80 B's, units, or minutes per hour as an incentor's output. In other words, in comparison with the 25 per cent we have been using for the standard hour plan, they expected to pay 33⅓ per cent for the same performance when the worker was given all the bonus earned. The comparable standard would be 1.25 minutes and 1.33 minutes with the incentive worker performing the job in one minute in both instances and in one case receiving 25 per cent bonus and in the other 33⅓ per cent bonus.

5. Incentive Performance Plans

These plans are also variously known as "Standard Performance Plans" or "Efficiency Plans." Because of the ambiguity associated with the word "standard," it is felt best to use the title "Incentive Performance Plans" to identify this group of plans because the allowed time used is the incentive time, and the calculated efficiency is expressed as an incentive index or incentive efficiency, all as previously defined.

By use of a conversion factor, either as a multiplying factor or as a tabular value, the performance index is converted directly to per cent bonus or per cent base rate earnings.

The Incentive Performance Plan equivalent of the Standard Hour Plan with an expected attainment of 25 per cent bonus would be as follows:

If the incentive time allowed for performing a job was one minute, this time would represent a 1.00 incentive index or 100 per cent incentive efficiency. The Standard Hour break-even point of 1.25 minutes would become 0.80 incentive index or 80 per cent incentive efficiency. Then for every 1 per cent of improvement in efficiency, the worker would receive 1.25 per cent bonus. The per cent bonus calculation then becomes 1.25 (incentive efficiency—80).

This type of plan seems to be used somewhat increasingly for several reasons. It is possible to use a complex earnings curve formula

and multifactor plans, yet to keep the actual earnings calculation relatively simple. It is likewise possible to use a variety of incentive formulas, both interdepartmentally and interplant and yet to have a directly comparable incentive efficiency or index.

Also, some advantage accrues from the incentive time values being directly usable for production and capacity planning without modification.

The Incentive Performance Plan equivalent of the Halsey 50-50 plan with an expected attainment of 25 per cent would be as follows: again with an incentive time of one minute the break-even point would be approximately 67 per cent incentive efficiency. Then each per cent improvement in efficiency would reward the worker 0.75 per cent bonus. The bonus calculation thus becomes 0.75 (incentive efficiency—67).

Obviously since the conversion factors are constant for each type of incentive plan, it is possible to reduce the work of calculation of the individual's bonus and earnings by precalculating simple tables covering these conversions. These relations are shown both graphically and in table form in Chapter Four.

6. Measured Day Work

This type of incentive plan is of recent origin. It came into some measure of popularity in the early 1930's, when there was a strong wave of opposition to incentive plans as such on the part of labor unions.

There are a number of variations of the plan in effect but they generally follow a common pattern. Standards are established just as they would be for any incentive plan. The application, however, takes a new form. This form is that first the base rate for the job is established in accordance with rate structure principles. Then higher hourly rates are set at various levels of efficiency, usually on a direct proportion or 100 per cent basis. The worker's performance against standard is translated into terms of efficiency each day and posted in the shop.

When he achieves a certain average efficiency for a stated period, usually three months, his base rate is increased accordingly, and is in effect for the next three months. Then the efficiency he achieves for that next three months is the basis for the next period's hourly rate. For example, let us assume that the rate structure base rate for a job is 80 cents. Under Measured Day Work we shall estimate that if a worker averages 80 per cent efficiency he earns the base rate of 80 cents. Then we would set up a scale of, say, 85 per cent efficiency

equals 85 cents an hour; 90 per cent efficiency equals 90 cents an hour; 95 per cent efficiency equals 95 cents per hour; 100 per cent efficiency equals one dollar an hour; and so on.

A worker A, when the plan is first placed in effect, has an efficiency of 80 per cent for a base rate for the first period of three months, or 80 cents. Then if during that three-month period he achieved an average of 90 per cent efficiency, his rate of pay for the next three months would be 90 cents per hour. If during that second three-month period his efficiency dropped to 85 per cent, his rate of pay should be reduced to 85 cents an hour for the following or third period.

It was the application of this descending feature of the plan that caused most trouble and was largely responsible for the elimination of the incentive feature of the plan. In other words, it worked reasonably well as long as the worker's efficiency remained static or on the ascendancy. When his efficiency started to descend because of poorer performance, arguments and disagreements arose when the rates were reduced accordingly. This reception of the unfavorable feature proved so upsetting that the plan, as a true incentive plan, fell into disfavor. Yet if the descending factor was not kept in full force along with the ascending, the plan degenerated into a device to increase wages more or less permanently without the required sustained output to justify it.

It is obvious that under a plan of this sort a very heavy burden is placed on the supervision if the level of output is to remain satisfactory. This is due to the fact that the incentive factor has been dulled by the long period application to the point that the worker is inclined to acquire a reasonably high efficiency rate for a period and then coast on the strength of it. Thus it falls to the lot of the supervisor to attempt to encourage him to maintain his output level with only a negative incentive—that of a lower rate in the future—to aid him.

Generally, where this plan is in effect, the incentive feature has been discontinued. However, the control feature has been kept in full as a measuring stick and aid to the supervision in their effort to improve the efficiency of the individual worker and the department as a whole. Although such improvement is difficult to accomplish without a financial incentive, under this plan the financial incentive is so weak it is of little help. As a control mechanism it is highly desirable. As an incentive plan, in our opinion, it has been found wanting.

The area of its most likely use would be an industry where a conveyor or other automatic equipment controls production. Also, it has been used in situations where an extreme hazard exists insofar as quality is concerned, requiring unusual care on the part of the operator.

However, even here it does not seem as effective as some other plan, such as the Standard Hour. As indicated before, the length of the stated period may vary, one month usually being the minimum period and three months the maximum period—and probably the most commonly used.

If for any reason it was deemed undesirable to place an incentive plan in effect, the application of Measured Day Work as a control device would be recommended. The same end could also be achieved by eliminating the incentive feature and retaining the control feature of the other plans we have discussed.

CHAPTER THREE

Eleven Basic Requirements of a Sound Incentive Plan

Before making any further comparisons of the six plans we have discussed, it is desirable that we consider what are the eleven basic requirements of a sound wage incentive plan. There are other features and requirements, but at least these eleven should be considered and used as measuring sticks of the desirability and completeness of any incentive plan.

1. The Plan Should Reward the Employee in Direct Proportion to the Increased Productivity

Justly or unjustly the worker does not like to share the direct result of his greater output. The worker feels that fair standards should be established and, once he meets and exceeds those standards, he should receive the full benefits therefrom. Thus any part payment plan is faulty in this aspect.

This is a logical conclusion not only from the viewpoint of the worker but also of the management. It presupposes that the plan is on a sound and equitable basis. Therefore the worker is entitled to the full gain from exceeding standards, and management should provide maximum encouragement for him to exceed them.

2. The Plan Should Be Understandable and Easily Calculable by the Employees

It is necessary that the worker be able not only to determine his earnings from the percentages furnished him but also to understand how the percentages are determined. Any plan that is not understood or easily figured by the worker is looked upon with disfavor and distrust. Any plan, no matter how complex or how simple, that is designed to limit earnings will finally be detected with most unfavorable results. The savings effected through the employees meeting the standards, thus increasing production or maintaining it, plus the natural result of lower overhead, should be ample remuneration for any employer.

3. Hourly Base Rates Should Be Guaranteed

Under any plan the worker should be guaranteed his base rate so that he knows that no matter what happens the least he can earn for any hour spent in the plant is his guaranteed base rate. This base rate is the one determined by a properly established basic rate structure and not an arbitrarily chosen lower rate. There should be one base rate for a job regardless of whether or not it is on incentive. This eliminates the uncertainty and insecurity of earnings that once accompanied most incentive plans and made the worker reluctant to accept them.

4. There Should Be Enough Spread Between the Guaranteed Base Rate and the Normal Bonus Rate to Provide Incentive to Extra Effort or Sustained Effort

This can be too large as well as too small. When too small the incentive to produce is lacking. When too large it may be ineffective because the reward for increased output starts before the increased output is discernible, resulting in higher unit labor costs. What this spread should be is largely a matter of opinion and it seems to vary somewhat with economic conditions. Twenty-five per cent is recommended, with 20 per cent a minimum acceptable spread and 30 per cent the maximum desirable spread.

5. It Should Provide Enough of a Guarantee of Standards to Give the Worker a Feeling of Security

The standard must be guaranteed against any change except when there has been a definite change in methods, tools, equipment, specifi-

cations, or materials which affect the rate of production. This guarantee must be meaningful and strictly adhered to. The standard should never be changed merely because some exceptional worker is earning a seemingly excessive bonus. There are exceptional workers, and they must always be recognized as such. All this obviously requires that standards be developed as scientifically as practicable to assure the maximum consistency.

6. Definite Instructions Covering Policy and Methods Should Be Provided

Management must unfailingly define and establish the policy as to what it will and will not do and what employees may and may not do. A weak vacillating policy or group of policies can do irreparable damage in all phases of wage administration. In all cases where the line is not clean cut as to what is fair, rule in favor of the worker.

7. Shop Procedure Should Be Standardized

Standard procedures include definite material and equipment requirements, clean-cut specifications, production control, and standard operating instructions, in addition to the other phases of good shop control.

8. Measured Standards Must Be Based on Definite Quality Requirements with Proper and Direct Controls Placed over Waste

Provision for maintaining quality and saving materials are essential factors in the development of any standard. Such controls must be clearly and specifically set forth with definite methods of measurement given.

9. Equitable Adjustment for Failure to Meet the Task when the Cause of the Failure Is Beyond the Employee's Control Should Be Provided

By placing the responsibility for each failure where it belongs, management not only indicates its fairness to labor but also focuses attention on organizational weaknesses and insures institution of corrective measures.

10. Once Production Is Such That Bonus Is Earned, Unit Labor Costs Should Be Constant

This is desirable from a cost and budget standpoint as well as being indicative of the fact that the employee is receiving the full benefit of his greater output.

11. To Be Effective the Plan Must Be Rigidly Maintained

The most essential practice in the operation of any incentive plan is its maintenance. Is there anything more important to any worker than his wages? Of course he is interested in better working conditions and special privileges, but above everything else he is interested in the pay he receives for his efforts and the fairness with which this amount is determined.

CHAPTER FOUR

Comparison of Incentive Plans

In making our comparison of these various plans, it would probably be simpler if we compared each one with the Standard Hour Plan. This basic plan, we feel, is the most desirable one we shall discuss.

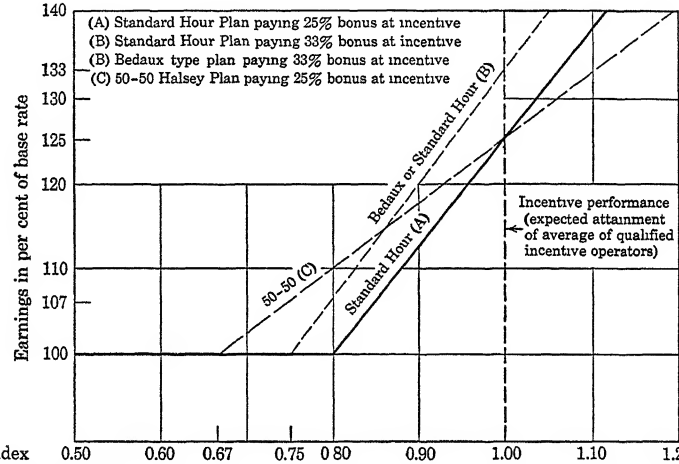
COMPARISON BETWEEN PIECEWORK AND THE STANDARD HOUR PLAN

Because the only fundamental difference between Straight Piecework and the Standard Hour Plan is the fact that under Piecework the standards are expressed in terms of money and under the Standard Hour Plan they are expressed in terms of time, we shall confine our comparison to their relative simplicity and acceptability.

1. The Piecework Plan links the time study function directly and completely with money, which is undesirable from an employee acceptance standpoint.
2. In the event of blanket wage changes, the problem of changing all the piece rates in effect is large and costly from a clerical standpoint.
3. Piece rates and bad wage practices are synonymous in the minds of many workers and union leaders. Therefore, they do not readily accept the Piecework Plan.
4. The only advantage which the Piecework Plan can possibly have over the Standard Hour Plan is that money rates may be more easily understood than time rates. This advantage, if it exists at all, is slight.

COMPARISON BETWEEN THE 50-50 PREMIUM BONUS PLAN AND THE STANDARD HOUR PLAN

Both plans call for a guaranteed base rate equal to the day work rate for the job. Both plans can provide for earning the same percentage of bonus, in this case 25 per cent for normal output. There is, however, a distinct difference in the production point at which the bonus starts to be earned. The only production point at which the same percentage of bonus is earned under both plans is at the incentive performance or 25 per cent point. See Figure 1 and its accompanying table for a further illustration of this point.



Incentive Index	0.50	0.60	0.67	0.75	0 80	0.90	1.00	1.10	1.20	
% Production—Standard Hour		75	83	94	100	113	125	138		Curve A
% Production—Bedaux		80	89	100	107	120	133	146		Curve B
"Unit Hour"—Bedaux		50		60		72	80	88		
% Production—Halsey 50-50		90	100	113	120	135	150	165		Curve C

Relative measures of productivity

Figure 1. Comparison of Productivity and Earnings for Representative Incentive Plans.

As can be noted in Figure 1, the break even or 0 per cent bonus point on the 50-50 Plan falls at an incentive index of 0.67 and at 83 per cent production on the Standard Hour Plan. On the other hand, production at the 0 per cent bonus point on the Standard Hour Plan calls for the payment of 10 per cent bonus on the 50-50 Plan. This illustrates clearly the fact that the 50-50 Plan calls for starting to pay bonus at a lower production rate than does the Standard Hour Plan. Although this feature does offer encouragement to the worker

by paying bonus for a relatively low rate of output and has some value from an acceptability standpoint, at the same time it favors the substandard worker, which is not desirable. Both plans pay 25 per cent bonus at the incentive performance point, but it should be noted that the rate of production which calls for paying 50 per cent bonus under the Standard Hour Plan calls for paying only 40 per cent under the 50-50 Plan. Thus it is said that the 50-50 Plan penalizes the above-normal worker, which is most undesirable from any standpoint.

TABLE I

Data for Figure 1

Incentive Index	Standard Hour Curve A		Bedaux Curve B		50-50 Halsey Curve C	
	Production Efficiency, %	Earnings, %	Production Efficiency, %	Earnings, %	Production Efficiency, %	Earnings, %
0.50	63	100	67	100	75	100
0.60	75	100	80	100	90	100
0.67	83	100	89	100	100	100
0.70	88	100	93	100	105	103
0.75	94	100	100	100	113	106
0.80	100	100	107	107	120	110
0.90	113	113	120	120	135	118
1.00	125	125	133	133	150	125
1.10	138	138	146	146	165	133
1.20	150	150	159	159	180	140

The variation in unit labor costs between the two plans is reflected in Figure 2 and its accompanying table. Under the Standard Hour Plan the unit labor cost is variable up to the 0 per cent bonus point and is fixed from there on. Under the 50-50 Plan the unit cost is variable at all times because of the split bonus feature. As can be further noted, the unit costs under the two plans are the same up to an incentive index of 0.67 which is 100 per cent production on the 50-50 Plan and its equivalent 83 per cent production on the Standard Hour Plan. From that point on, the unit cost for the same production is higher under the 50-50 Plan up to the 25 per cent bonus point on both plans, where they are equal. From the 25 per cent bonus point on, the unit cost is lower under the 50-50 Plan. However, the same feature that makes this possible also tends to discourage increasing production beyond the 25 per cent bonus point because of the ever-increasing effect of the diminishing returns to the worker as production is increased.

TABLE II

Data for Figure 2—Unit Cost Versus Incentive Index

$$\text{Relative Unit Labor Cost} = \frac{\%\ \text{Earnings}}{\text{Incentive Index} \times 100}$$

Incentive Index	Standard Hour Curve A		Bedaux Curve B		50–50 Halsey Curve C	
	Earnings, %	Unit Cost	Earnings, %	Unit Cost	Earnings, %	Unit Cost
0.50	100	2.00	100	2.00	100	2.00
0.60	100	1.67	100	1.67	100	1.67
0.67	100	1.50	100	1.50	100	1.50
0.70	100	1.43	100	1.43	102	1.46
0.75	100	1.33	100	1.33	106	1.42
0.80	100	1.25	107	1.33	110	1.38
0.90	113	1.25	120	1.33	118	1.31
1.00	125	1.25	133	1.33	125	1.25
1.10	138	1.25	146	1.33	133	1.20
1.20	150	1.25	159	1.33	140	1.17

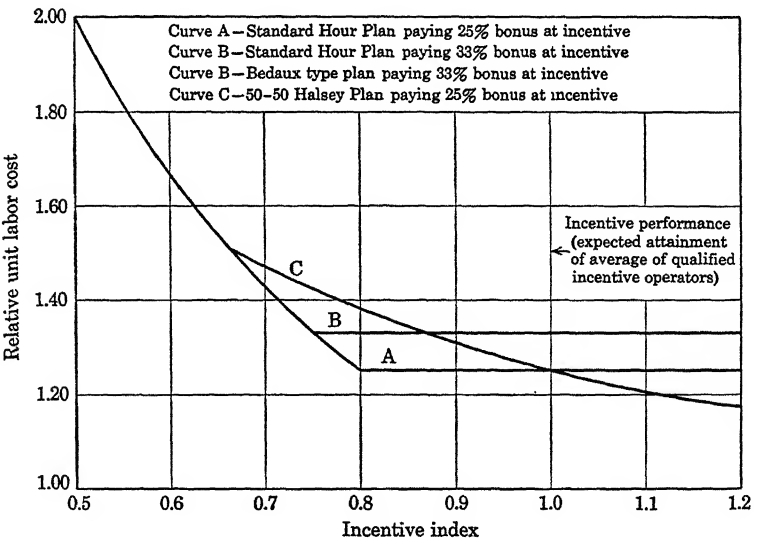


Figure 2. Unit Labor Cost Versus Incentive Index for Various Incentive Plans.

COMPARISON BETWEEN THE BEDAUX PREMIUM POINT PLAN AND THE STANDARD HOUR PLAN

The Bedaux Plan is also based on a guaranteed base rate equal to the day work rate established for that job. Both plans pay 100 per cent of the bonus earned to the worker. Under the Bedaux Plan, however, a higher per cent bonus is normally paid for the same production, as ordinarily it calls for paying 33 per cent bonus at normal output compared with the 25 per cent bonus called for by the Standard Hour Plan.

The variation in the per cent of bonus earned is reflected in Figure 1 and its supporting table. This figure shows that the break-even point for the Standard Hour Plan is equal to 7 per cent on the Bedaux Plan. Reading further, we find that at the 13 per cent point on the Standard Hour Plan, 20 per cent bonus is paid under the Bedaux Plan. As stated earlier, the 25 per cent point on the Standard Hour Plan calls for the payment of 33 per cent bonus under the Bedaux Plan.

The variation in unit labor cost is reflected in Figure 2 and its supporting table. Here it is shown that the unit costs are equal up to the break-even point on the Bedaux Plan, which is 0.75 on the Incentive Index. Although both plans have a constant unit cost once they reach their own break-even point, the break-even or 100 per cent point on the Standard Hour Plan is equal to 107 per cent on the Bedaux Plan. From that point on, the spread between the two plans is constant.

COMPARISON BETWEEN THE INCENTIVE PERFORMANCE PLAN AND THE STANDARD HOUR PLAN

The Incentive Performance Plan, as stated earlier, may be used to duplicate the earnings to performance ratios of any incentive plan. It obviously is not possible to make any generalizations as to its relative operation as an incentive plan. If the Incentive Performance Plan is designed to duplicate the earnings of the Standard Hour Plan it compares very favorably. Its one disadvantage is that the calculation of earnings is slightly more involved than with the Standard Hour Plan. If the Incentive Performance Plan is designed to provide a split earnings feature it then is subject to the criticism leveled at those plans.

The Incentive Performance Plan does provide a simpler way to handle multifactor incentive problems. For example, for the supervisor's bonus plan on page 133, three of the five factors are expressed in this fashion.

COMPARISON BETWEEN THE MEASURED DAYWORK PLAN AND THE STANDARD HOUR PLAN

Theoretically the measured daywork form of wage incentive will, over a period of time, give the same earnings and cost relations as the Standard Hour Plan—except for one important difference. The difference is that the payment for any given pay period will reflect the performance of some previous period. This slowness of reaction has usually contributed to a somewhat lower level of attainment than is obtained by the more direct plans.

It does provide a slightly simplified payroll calculation since the same earned rate is used for a considerable period of time. It is necessary, however, to calculate cumulative performance over a much longer period than for the other plans.

Summary of Comparisons of Plans

In summarizing the comparisons of the plans we have discussed, we might consider the various points brought out in the light of the eleven basic requirements given in Chapter Three.

1. The Plan Should Reward the Employee in Direct Proportion to the Increased Output

Piecework and the Standard Hour and Modern Bedaux Plans all meet this requirement. The Incentive Performance Plan may if it is so designed. The Measured Daywork Plan does in principle, but the inherent time lag limits its effectiveness on this score. The 50-50 or Halsey Split Plan does not, as it calls for sharing the results of the increased output.

2. The Plan Should Be Understandable and Easily Calculable by the Employees

Piecework and the Standard Hour Plan are the most easily understood. The Bedaux Plan is next in this respect and, if its standards were expressed in minutes, would be as easily understood as the Standard Hour Plan. The 50-50 Plan is more difficult to understand because of its split feature, which requires sharing the bonus earned. The Incentive Performance Plan is usually the easiest to understand if multiple factors are involved. For a single factor plan it is similar to the Bedaux Plan. Measured Daywork is also only slightly more difficult to understand than the Standard Hour Plan.

3. Hourly Base Rates Should Be Guaranteed

All plans meet this requirement in modern practice.

4. There Should Be Enough Spread Between the Guaranteed Base Rate and the Normal Bonus Rate to Provide Incentive to Extra Effort or Sustained Effort

It is obvious from the preceding discussion that any of the plans may be designed to provide an adequate spread between daywork and incentive earnings level. The 50-50 Plan does not fully meet this requirement above the incentive level because of the split nature of the plan.

Most companies have found a 25 per cent bonus at the incentive level of performance to be adequate, although the trend of average earnings seems to be moving slightly higher.

5. It Should Provide Enough of a Guarantee of Standards to Give the Worker a Feeling of Security

All plans can and should meet this requirement.

6. Definite Instructions Covering Policy and Methods Should Be Provided

Here again all plans can and should meet this specification.

7. Shop Procedure Should Be Standardized

This is a fundamental principle that can be incorporated in the basis of all plans.

8. Measured Standards Must Be Based on Definite Quality Requirements with Proper and Direct Controls Placed over Waste

Keeping in mind modern applications of all plans, we see that they can be equal in this respect.

9. Equitable Adjustment for Failure to Meet the Task when the Cause of the Failure is Beyond the Employee's Control Should Be Provided

This is in reality a management policy requirement that can and should be a feature of any incentive plan.

10. Once Production Is Such That Bonus Is Earned, Unit Labor Costs Should Be Constant

Piecework and the Standard Hour and Modern Bedaux Plans meet this requirement directly. The Standard Performance Plan may if so

designed. Measured Daywork may indirectly, but in practice seldom does. The 50-50 Plan does not.

11. To Be Effective the Plan Must Be Rigidly Maintained

This is another fundamental management policy that can be applied equally to all plans.

As stated earlier, the Standard Hour Plan is the most generally satisfactory plan.

The Bedaux Plan, or a similar plan, is next in desirability. The Bedaux and other comparable plans popular in the 1920's fell into disfavor with organized labor primarily because of the lack of understanding prevalent at that time, of the effort required to simplify, standardize, and organize work before it is placed on incentive. These plans also suffered from lack of sound policies governing them as well as a sound concept of the proper use of incentive plans. They have become more acceptable to labor in recent years; nevertheless, their acceptability is still lower than that of others not similarly spotlighted.

The 50-50 Plan is generally the least desirable and should not be used. It is outmoded. The reasons for its split feature should no longer exist in modern practice, and its sharing principle is not acceptable.

Because of its control features and versatility for multifactor incentives, the Incentive Performance Plan can be extremely useful in the future. The individual application should be designed, however, to duplicate to the maximum the basic soundness of the Standard Hour Plan.

PART TWO

Preparation for Incentives

In order for the incentive installation to have maximum assurance of success, both the technical preparation and industrial relations climate must be sound. The purpose of this section of the book is to provide understanding and guidance for those contemplating either the initiation, revision, or extension of incentive coverage in their organization.

It is difficult to deny that a soundly conceived and executed incentive plan is the best and most satisfactory method yet devised to recognize and reward individual differences in workers on the same operation. The problem facing management is one of so planning, organizing, and administering its incentive systems that even the most arbitrary labor leaders cannot equitably deny their soundness and fairness. This can be done and must be done if management is to achieve lower costs and at the same time recognize and reward workers whose rate and quality of output justify such an award. The time required and difficulties faced in obtaining full acceptance of incentive plans can best be determined by a study of a company's past practices and policies governing their use.

CHAPTER FIVE

Management and Wage Incentives

The final responsibility for the success or failure of an incentive plan rests with the company management. The first consideration then in properly preparing for an incentive installation is the role which management must play to provide the proper setting for this success. This will require the consideration of the contributions which can be made by all levels of management.

The contributions which management must give to the incentive program are three. These are: first, belief; second, understanding; and third, support.

A Complete Incentive Philosophy

For the entire organization to support and believe in incentives the top management must possess this belief, which may take the form of an incentive philosophy such as that evidenced by the management at Lincoln Electric Company, Cleveland, Ohio. This company's records of cost reduction and high wages are, to many, almost beyond comprehension. J. F. Lincoln himself credits much of their success to their incentive idea. This idea or philosophy may be expressed essentially as follows:

Each and every individual possesses latent abilities, both mental and physical, in far greater abundance than he normally utilizes. The dual rewards of individual recognition and material gain through wage incentives provide powerful encouragement to the use of these latent abilities.

Special emphasis should be placed on the fact that this natural response is ascribable to all. Therefore, to be most successful, incentive opportunity should be provided to all individuals insofar as possible. Only when every attempt is made to do so can management honestly assert that it believes in incentives.

LIMITED INCENTIVE IDEAS

The complete dedication to the incentive idea just described may be contrasted to the attitude existing in many companies. In such companies incentives are often provided for two levels of employees: those at the very top and those at the very bottom of the organization structure. For the top executives a bonus based on the profit and progress of the company is distributed. For the production workers a wage incentive based on their productivity is prescribed. Totally overlooked in terms of reasonably direct financial incentives are the all important contributions of middle management and staff.

In instances of this type it is not unusual to find a marked lack of enthusiasm for the incentive program on the part of both foremen and staff, such as those in payroll and accounting. All their jobs are made more difficult both technically and in terms of human relations by the establishment of wage incentives. At the same time, no similar goal of financial reward is offered to encourage them to grow into and to gain from their enlarged responsibilities. Small wonder then that such individuals may unwittingly inhibit, passively resist, or openly oppose the establishment of incentives.

It thus behooves management to think through its total views on incentives before deciding on its course of action and to develop as complete an incentive philosophy as possible.

Management Understanding

Before management can decide what its course of action should be it is important that it have complete understanding of what is involved. In addition to the technical features, history, and philosophy previously discussed, it must consider that incentives are not a panacea providing automatically lower costs, higher wages, and a substitute for good

supervision. It must also recognize that all management will need an increased amount of courage to handle more administrative problems with the possibilities of greater operating risks.

Management Support

Only when management has the belief in and understanding of wage incentives previously discussed is it truly ready to give the kind of support an incentive program must have. This support takes many forms and must be continually demonstrated. Notable among these forms of support are:

1. The participation in the development and presentation of the program and policies.
2. The provision of adequate personnel to develop and administer the program.
3. The support of the wage incentive administrators once the plans have been installed.

The first and the second are discussed in some detail throughout the rest of this chapter. More discussion of policy and presentation and support are found in later chapters. The attitude and degree of cooperation on the part of the hourly workers depend almost entirely on the soundness of the policies established by the general management, and the actions of the supervisory staff and engineers. These are the key factors.

GENERAL POLICIES

Management must have its policies and thinking concerning this program and its results well in hand before the program is started. It must be prepared to express and discuss these policies with the employees in a clear concise manner before any actual work is done in the department or plant. These policies should include the following subjects (general examples are given for illustrative purposes):

1. The General Objective of the Study

To so simplify and organize the work in the department that waste will be eliminated to the degree that costs are lowered, the product improved, and the company's competitive position improved to the general good of all concerned.

To protect the jobs and earnings of all employees concerned to the maximum degree. To provide an opportunity through a sound incentive plan for the employees to increase their earnings over and above their base rates. To keep the employees fully informed at all times and to make them partners in the study to the maximum degree practicable.

2. Job Security

No one will be laid off as a direct or indirect result of this study. Should anyone be released from his duties by the study, he will be given plantwide seniority and every effort made to re-establish him at his highest skills. Any excess labor remaining will be placed in a pool until such time as normal labor turnover reabsorbs them into regular jobs.

3. De-emphasis and Dislocation of Skills

De-emphasis of skills does not necessarily follow such installations. Just as frequently, a greater need for the use of skill results from proper organization of the work. Should the skill requirements be lessened to a degree where the economic value of the job is materially lessened, then every effort will be made to transfer the workers to other equal skill jobs or to find other means of maintaining their take-home pay.

Where, through change in job content, skills are disrupted, formal programs to train the workers in the new methods will be established. Ample time will be allowed for this purpose, and earnings will be fully protected during the training period. Strong efforts will be made to keep assignments in line with each worker's capabilities and interests.

4. Establishment of Work Standards

All standards will be set in a fair and equitable manner. The output requirements will be established on the basis of what an average man suited for that type of work can or should produce.

Realizing that errors in judgment can be made, formal appeal channels to the foreman will be established. All appeals will be checked as soon as possible, with earnings being protected by making any changes retroactive to the time of the appeal.

Older or slower workers who cannot meet the minimum requirements of the job will be transferred to work more in keeping with their abilities.

5. Performance Requirements Against Standards

Although consistent underproduction against standards proved in practice cannot be permitted, nevertheless it is recognized that standards may not always be met. Variations in the output will be analyzed and efforts made to overcome controllable causes. When variations are a result of the worker's physical or emotional condition, his supervisor will work with him and suitable solutions will be reached.

6. Rate Cutting

All standards will be set with care. No standard will be changed without good and sufficient cause. No standard will be changed without due notice to all concerned with full explanations of the reasons given.

Although other policies may be needed to fit a given situation, nevertheless these should be included in the ones thought through and prepared prior to any approach being made in the plant. Detailed policies relative to the operation of the plan should be prepared well in advance of the installation. Chapter Seven is devoted to these policies.

ADEQUATE PERSONNEL

THE FOREMAN. The foreman of the department must accept full and direct responsibility for the program. He must believe in it, understand it, and become the driving force back of it. In doing so, he should in no way relinquish any of his prerogatives as foreman to the engineers during the study. The engineers, on the other hand, do not want to assume any of the foreman's responsibilities. They are there as technical assistants to him. They are staff men, and to accept or be given any line responsibility would only hinder them in their work. This is an obvious distinction but, because of past misunderstandings, it is well to repeat it here.

We are asking a lot of our foremen to accept this responsibility. In doing so, we must recognize that with few exceptions management has failed to set up a formal program whereby its foremen could be trained to accept this responsibility in a creditable manner. Management has also come to realize more and more the type of individual required to make a successful foreman. It now recognizes that he must be a leader of men, a manager, and that he must at least know how to use the simpler tools of management. In recognition of these needs,

most managements have instituted comprehensive training programs to aid the foreman to become better qualified for his job.

We are now asking the foreman to assume the responsibility for this industrial engineering and incentive program. If he is to do this successfully he must be trained in at least the fundamentals of such work. He must have a sufficient grasp of what is involved in developing such a program so that he can not only make valuable suggestions to the engineers but can also readily answer the questions of his men. The latter point is of great importance. A workman naturally looks to his foreman for guidance and has confidence in him as his supervisor. If the workman knows that the foreman believes in this program, understands it, and is guiding and approving every step of it, then he knows that his interests are being protected. This relationship of confidence and understanding must be present, and no program should be started until it is present.

THE ENGINEERS. It is extremely important that those people charged with the responsibility for the installation and operation of the wage incentive program be adequate in numbers to install, *maintain*, and extend reasonable coverage. Their training and experience should be adequate to provide consistent standards and mature yet imaginative guidance to the program.

We have discussed previously the need for men of high caliber and good training to act as industrial engineers. It is every bit as important that these men be carefully selected and properly trained as it is that the foremen be fully qualified. The engineers must not only be sound from a technical standpoint but also from a human relations standpoint. They must be able to sell themselves and their work to everyone in the department. They must be able, by repeated good performances, to earn the respect and good will of the supervisors and workmen. They must be able to establish a reputation for competence and fairness, and they must have the friendliness that is absolutely necessary to the successful development of this work.

All this is further emphasized as we later develop the relations between methods, standards, and wage incentives.

CHAPTER SIX

Relations with Employees and Unions

Ultimately the success of an incentive installation depends upon the individual employees. Their acceptance of the tasks assigned and their response to the financial rewards offered will be the determining factors. For best results the employee must be ready to accept his responsibility by becoming a partner in the installation and operation of a sound program. He must cooperate to make the studies valid and to allow the installation of the results. To do this he must believe that the plan is sound and fair. Attention is to be given in this chapter to a consideration of what may be required to attain this cooperation.

In recent years, unions have obtained a more active role in connection with many incentive installations. In fact, some people are so concerned with the union relations in this connection that they may overlook the relations with the individual employee. Although employee relations and union relations may be completely integrated in a given situation, it is wise to consider them separately as we attempt to develop a program that is sound in both respects.

At this point in our discussion let us avoid the complications introduced by collective bargaining and all its ramifications. Let us consider only the human relations standpoint, which after all is the heart of the problem.

Employee Relations and Wage Incentives

The relationship between wage incentives and sound employee relations has been one of the most complex problems in the entire field of industrial relations. The history of this relationship is not one of which to be proud. In looking back over the past two or three decades that this association has existed, let us profit by the mistakes made and, with a minimum of indictments and denouncements, look to the future and build toward that sound relationship which can and must exist.

Of all the factors that have made the American workman stand out above all others, two are most prominent. They are his confidence in his ability to do a job, and his pride in his work and the place where he works. Rob him of these and you have stolen his elements of greatness.

Therefore, it is management's duty and privilege to see to it that nothing disturbs its employees to the degree that their initiative and effectiveness are lost. If management does fail in this respect, our whole industrial system will suffer.

UNDERSTANDING THE EMPLOYEE'S VIEWPOINT. Before management can hope to develop the kind of industrial relations climate that will lead to the successful operation of a wage incentive plan, it is important that it understand the attitudes of its own employees. The nature of these attitudes toward wage incentive plans will vary from situation to situation. They will depend to a great extent on the beliefs of the employee, as well as on any demonstrable facts.

Although all are seldom found in any one situation, a considerable number of objections to incentives have been raised by employees based on a series of beliefs taking the following patterns:

1. Their jobs will be de-emphasized to the degree that their skill and knowledge are no longer economic assets to them.
2. They may be required to work at a pace they cannot maintain without injury to their health, so they may age prematurely. Although this concept is encountered less and less frequently, it still may be a factor.
3. There will be a reduction in the force, which will throw them out of work. Although the "lump of work" theory may be thoroughly discredited, it is still believed by many.
4. If they do not meet the standards every day they will either lose their jobs or be demoted.

5. The rate will be cut as production increases so that they will have to turn out more and more work for the same money.

6. Their earnings will fluctuate, so that it will be more difficult to plan their personal activities because standards of performance cannot be established equitably.

7. The gains will not be equitably shared with the workers because management's motives are questionable.

8. The plan will be too complicated to understand.

9. They will have to change many of their work habits, including their work methods, and will be subjected to spying by the standards men.

10. They will have to compete with their friends and thus risk destroying pleasant work associations because they may have to exceed accepted group norms in order to meet the standard.

These negative beliefs may be said to be inspired by fears about the security of the individual's job and earnings, by the natural resistance to change that seems inherent in most human beings, and perhaps more importantly by the trust or lack of trust that the employees feel toward their own management.

THE ELEMENT OF FEAR IN THE WORKER'S RESISTANCE TO WAGE INCENTIVES. When we stop to analyze the single greatest element in the employee's resistance to wage incentives we find it to be some form of *fear*. We find this fear taking many turns, all of them understandable, and sometimes justified in view of past practices. All of them are surmountable and removable. All of them are unnecessary to the degree that their existence for any period of time represents a failure on the part of management and others responsible for carrying on and interpreting the work of installing the wage incentive plan.

Analyzing this fear, we find that it is the unknown elements, the mystery that so often in the past surrounded this work, that is largely responsible for it. Workmen have a right to be and want to be "in the know" about anything that vitally affects them. Therefore, it should be a fundamental policy that before *any* work is done, *the workers be fully informed of what is to be done, how it is to be done, and the goals sought. Furthermore, as each step is taken, it and its results should be fully discussed with them and the progress be made only as fast as the workers can absorb and assimilate it.*

In any given company or situation the degree and strength of these fears will depend largely upon the past experiences of the workers themselves in regard to incentives. They will also depend upon the

experience and reputation of the use of incentives in other plants in the community. They will depend upon the harmonious relations and the confidence existing between the employees and the management.

Where strong fixed emotional beliefs of an unfavorable nature exist, the introduction of an incentive program must be carefully managed or it will surely fail. This being so, it behooves management to see to it that all such projects are managed carefully and meet every test of fairness and equity with a maximum of protection for the workers involved.

Work Backlog and Degree of Workers Acceptance. Regardless of any individual's or group's basic attitude toward incentive plans, there is one major factor that strongly affects the degree of its acceptance. This factor is the volume and backlog of work facing a plant. Workers are markedly more receptive to incentive plans when the volume of work is on the ascendancy than when it is starting to diminish. The reason for this is obvious. Yet if the incentive idea is sound, it should be not merely a prosperity device. Other ways and means must be found to offset the factor of "spread the work to make jobs." The price that must be paid in attempting to revitalize and equalize an incentive plan that has been permitted to decay and fall apart is very high from both a cost and employee relations standpoint. Accordingly, companies who experience wide swings in their production volume cycles must give this problem of proper maintenance during low production periods serious attention in their use of incentive plans.

It might be said that, on the whole, we are now emerging from the dark ages in the use of incentive plans as an integral part of a sound industrial engineering program. We find their use being advocated by government, management, and labor. Although not condoning past practices and mistakes, we must not be blindly critical. Every profession has learned the hard way of trial and error. The important point is that those who have made, and are making, real progress *do learn* from their past mistakes. It then behooves management, employees, and industrial engineers to view the position of wage incentives in the industrial picture objectively. *The success or failure of incentives lies in their combined abilities to understand their nature, place, and use.*

To counteract all these objections just related, management must provide a plan and general policies such as those stated in the previous chapter which will invalidate the fears of economic loss. It must use an approach that is psychologically sound in overcoming the resistance

to change. It must also conduct itself in all matters so that it develops the trust and respect of the employees. It must also not assume that all this is self-evident to the employee. The matter of developing employee attitudes that are receptive to incentive operation is a real challenge in the whole area of employee education and training.

SELECTING AND PLACING EMPLOYEES. The proper place to begin the preparation of employees for incentives is in the employment department. If the company has a sound and complete program to select new employees properly and to place them in jobs for which they are best fitted, it has taken a long step toward good employee relations. If, for any reason, a worker is on a job for which he is not fitted, he is aware of that fact before anyone else. The longer he is on the wrong job, the stronger will be his defense mechanism to oppose any move that might reflect against him. Accordingly, this worker has a real basis to fear such a program as we have been discussing. It is from such misplaced individuals that the strongest oppositions spring. We have discussed the problem of transferring these workers to jobs for which they are more fitted. Our goal should be to see to it that they are properly placed when they are hired.

The same thinking holds true for training. Even on poorly organized work, each employee should be trained to do the job in the best manner that has been established. It helps his morale and aids in determining his fitness and aptitude for that type of work. On work that has been organized and measured, proper training is a requirement for all new employees before they are put to work as regular employees. Thus their ability to perform the job is proved before they take their places in the production line.

The induction period for new employees is also an opportune time to indoctrinate them in the company's true position on wage incentives. It is imperative that from the beginning they understand the nature of the incentives and they understand the difficulties as well as the virtues of such a program. Care must be taken, however, not to oversell at this time.

Once employees are placed in the department, the bulk of the responsibility for properly conditioning their attitudes toward incentives falls on the direct supervision, aided and assisted by the industrial engineers. This conditioning or training of the employees requires both formal presentations and informal discussions.

THE APPROACH TO THE HOURLY EMPLOYEES. The matter of preparing examples and exhibits of techniques to be used, plans to be carried out, and results to be sought must be carefully planned, their purpose being to enable the supervision and engineers to illustrate their

explanations and discussions of the program in their initial and subsequent meetings with the employees. These examples can take the form of charts, blown-up examples of forms, and film, both still and motion picture. Films depicting the conditions before and after a job has been analyzed have proved especially helpful in explaining the work of such a program and the results sought. Case histories of other installations, especially if from the same company or plant, are always helpful.

Thus equipped, the foreman and the engineers are ready to hold their first meetings with the hourly employees. These meetings should be held before any actual studies begin in the department or in the plant if such a program is a new one. It is generally an excellent idea to have the chief executive officer of the organization write a letter to each employee, inviting him to attend the first meeting. This letter may also provide a statement of the company's official position relative to the program. The procedure should be further reinforced by this executive's appearance at the first meeting to further indicate interest and support. At this time full explanation is made of what is sought and how it will be accomplished. All matters of policy are discussed and explained. All questions raised are answered. If answers are not available, they should be obtained and given at the first opportunity. Similar meetings should be held as the study progresses and at the end of each phase of the program. It is particularly important that full explanations be given before any actual changes are made in the department.

While working in the department both the supervision and the engineers should be constantly on the alert to answer questions. They should encourage questions. Even when none are forthcoming they should talk things over with the workers involved in order to maintain the right relationship and to enlist their cooperation.

A practice to be recommended whenever it is practicable is the selecting of two or more key workers to work full time with the engineers during the entire project. These men are taught the various techniques used and are considered as regular staff members. Their intimate knowledge of the operations concerned is valuable, and they can be of real aid in getting the story of the study across to their fellow workers. It is a convincing move in view of the statement made that every step of the analysis and every result obtained are an open book to any worker who cares to study them or have them explained to him. Some companies have had considerable success by giving out information in special booklets describing their incentive programs. These booklets are most effective when they are used in connection with group meetings, and the information in effect summarizes the important points covered in the meetings.

The day is not far distant when formal training programs designed to teach hourly key workers the fundamentals of industrial engineering will be common and accepted practice in industry generally. The possibilities of such a general move are staggering to the imagination of every practicing engineer. In his mind it will be a long, happy step forward on the path of industrial progress.

Union Relations and Wage Incentives

A major change which has entered the industrial picture during the past few years is the trend toward union participation in fields of industrial management heretofore considered to be exclusively the province of the managers of the business. This condition represents another milestone or even a major directional turn in the course of our industrial progress. Its full potentialities are as yet only guessed. If properly controlled and guided it can prove to be one of the dynamic forces back of our next great industrial surge forward. If uncontrolled or improperly used it can disorganize and disunite the combined efforts of all who are interested in furthering our industrial system to the point where irreparable damage is done.

Labor Legislation and Wage Incentives. The discussion in this chapter is mostly concerned with the basic soundness of wage incentive installations relative to their human relations values. There are, however, certain aspects of interpretation relative to the National Labor Relations Act and arbitration of labor disputes that have a direct bearing on the establishment and operation of wage incentive programs and closely related problems. An exhaustive study of the scope of collective bargaining[1] led Walter Daykin to conclude that "The [National Labor Relations] Board has widened the scope of collective bargaining by ruling that the employer has a statutory obligation to bargain with the union over bonuses, profit sharing, pensions and insurance benefits." It follows then that wage incentives and the standards of performance that they are based upon become bargainable issues. To refuse to bargain about these matters would constitute unfair labor practice.

A later study of Daykin's concerned with the effect of arbitration on management's prerogatives has proved most illuminating. Extremely important to the incentive-minded manager and labor leader as well is the inference that although many of these matters must be bargained about, the contract, not the law, frequently determines the extent to

[1] Walter L. Daykin, *The Scope of Collective Bargaining*, Bureau of Labor and Management, State University of Iowa, Iowa City, 1951, p. 7.

which management abrogates its prerogatives. Daykin states, "An analysis of the decisions of the arbitrators reveals that in general, when management bargains with the union and signs a collective bargaining agreement his original authority and power to conduct his business operations is modified only to the extent that the employer voluntarily and specifically relinquishes such power and authority."[2] This important study is reproduced completely in the appendix; those portions directly pertaining to incentives are italicized.

COLLECTIVE BARGAINING. For added understanding of the nature of collective bargaining relative to wage incentives, one should read carefully and thoughtfully the work of David Gomberg. An excellent summary of his writing appears in a recent handbook. In discussing trade unions and industrial engineering, he gives an excellent interpretation of many union positions and backgrounds relative to wage incentives.[3] The writings are most revealing to anyone concerned with these relations.

Anyone who is specifically concerned with the variety of specific contract relationships is referred to Bulletin No. 908-3 of the United States Department of Labor.[4] This booklet provides an enlightening discussion and representative samples of the kinds of contract clauses which have been established relative to wage incentives.

FUNDAMENTAL BASES UNDERLYING AND AFFECTING THIS TREND IN UNION–MANAGEMENT RELATIONS

It is well to examine briefly some of the conditions and bases surrounding this new phase or era in our industrial commonwealth.[5] There are certain fundamental truisms, long recognized, that form a sound acceptable basis for this participation. One is the fact that a cooperative effort has a much greater chance for success than does one that is not cooperative. Another is that removing the shackles of fear

[2] Walter L. Daykin, *Arbitrators' Determination of Management's Right to Manage*, Research Series No. 6, Bureau of Labor and Management, State University of Iowa, Iowa City, 1954, p. 4.

[3] William G. Ireson and Eugene L. Grant, *Handbook of Industrial Engineering and Management*, Prentice-Hall, Inc., Englewood Cliffs, N. J., 1955, pp. 1121–1183.

[4] *Collective Bargaining Provisions*, Bulletin No. 908-3, United States Department of Labor, Bureau of Labor Statistics, U. S. Government Printing Office, Washington 25, D. C., 1948.

[5] John W. Riegel, *Management, Labor and Technological Change*, University of Michigan Press, Ann Arbor, 1942.

and uncertainty from a man's mind usually results in providing a willing, open-minded partner to our plans.

Even before the period when the doors of industry were opened wide to the organized labor movement, the practice of making a company's employees partners to a degree in those plans of the company that directly affected them was being advocated and followed sufficiently to prove the soundness of that approach to the particular problems in question. The rapid growth of labor unions plus the militant demands of their leadership for such participation have sharply accelerated the practice of this relationship. There can be no question of the desirability of making the hourly employees in the plant limited partners in reaching decisions on affairs that directly affect their jobs, regardless of whether or not they are formally organized into a labor union.

The scope of this partnership and the responsibilities entailed depend entirely on the circumstances and conditions surrounding any given situation. The fact that the employees are members of a labor union in no way changes the fundamental soundness of this relationship. It does, however, inject new conditions into the situation which may materially alter the degree and even the desirability of such a practice.

FUNDAMENTAL CONCEPTS NECESSARY FOR SUCCESSFUL EMPLOYEE PARTICIPATION

The answer to this whole problem of employee participation, in the solution of problems that directly affect them, depends wholly on the sincerity, integrity, and enlightened intelligence of two groups of individuals—the members of management and the union leaders.

THE MANAGEMENT. If the management group is composed of individuals typical of a bygone day who look upon the idea of open discussion and solution of common problems by management and labor as akin to consorting with the devil, or as sacrificing some of their "divine rights" as managers, then the experiment is doomed to failure. If they are men who feel that the cloak of their office includes a large portion of omnipotent wisdom that makes their ideas and opinions unassailable, then it is far better that the institution of this relationship never be attempted.

If they are men who recognize that such relationships are a definite step forward on the path of industrial progress, then there is real hope for success from the viewpoint of management's attitude. If they recognize that for any plan, whether it is an incentive plan, new plant

layout, method of work, or what have you, to achieve its full measure of acceptance and success it must be understood and believed in by the hourly employee, then they are mentally ready for this relationship.

If they recognize and act on the fact that they must do everything they can to eliminate mystery, fear, and insecurity from those acts that directly affect and concern their hourly employees, then they are blessed with the concept that makes for success in this partnership. If they recognize the value that lies in the ideas and thoughts that exist in the minds of their employees and seek out these ideas, they will do all they can to make this partnership work.

THE UNION LEADERS. If the union leaders are still possessed of the idea they fostered and believed during their picket line days, that management, and all it stands for, is their natural enemy, then a sound basis for this relationship is totally lacking. If they are among those who see their power as union leaders only as a predatory device to wring from industry all that can be obtained regardless of consequence or value given in return, then they obviously cannot be accepted as partners.

If they belong to that school which looks upon sound management practices, such as rate structures, incentives, and methods improvements, only as devices to attain stability of industrial relations and which believes that stability would only lessen the personal power of the union leader and is therefore undesirable, then they lack the proper concept of their positions. If they belong to that school among union leaders which thinks its objective should be to share equally the authority of management, but accept none of its responsibilities, then they are to be shunned.

If, on the other hand, they are labor statesmen who recognize the rights of management and capital as well as the rights of labor, then they are mentally and emotionally ready for such a relationship. If they believe in the premise that the future of our country lies in the furtherance of our industrial system and that, whereas labor must have its full share of the benefits of this system, it must also accept its full responsibility in aiding the advancement and development of industry, then they are welcome partners in solving these problems.

Therefore, before such a relationship can advance beyond the discussion stage, there must exist a mutuality of interest between the two parties involved. This interest must be clearly defined and understood by all concerned, with both groups determined to reach equitable and satisfactory conclusions.

DEVELOPMENT OF A BASIS FOR PARTICIPATION

In establishing a basis for union participation in the development and institution of such projects as a wage incentive system, there are certain fundamental concepts of responsibility and authority that must underlie this relationship. These are in addition to the mutuality of interest and other personal attitudes, concepts, and policies of both management and labor we have just discussed. These concepts are not affected by the degree of participation which, as we shall point out, can and will vary widely. They are:

1. The Final Power of Decision Should Rest with Management

Management is hired by the owners of the business to operate it for them. In effect, its members then become the trustees of the business. Management, if it is successful, must protect and foster the interest of both the employees and the owners of the business. In the long run the two are inseparable from an interest and economic survival standpoint. If one is favored over the other to any degree, for any period of time, the enterprise is certain to suffer, to the detriment of both groups.

Therefore the final power of decision, even as to whether or not the project should be continued, should rest with management. Its members alone are held responsible for the ultimate success of the business with the penalty of removal if they fail. They alone can and should be in possession of all the facts, in a corporate sense, of the business, and with that full knowledge are in the better position to make that final decision.

Should the union representatives disagree with management, they should not possess the power of veto or decision. Formal grievance procedures should be set up to provide labor with a full hearing. This may include in some cases the calling in of an outside specialist to review the data and give an opinion. However, in no sense should this be construed as arbitration. It should remain management's right to have that final power of decision as to what shall or shall not be done insofar as technological change is concerned. Of course, there would be nothing to prevent the union members withdrawing from a joint study project in which they were limited partners should they decide that was the thing to do from their standpoint.

Where mutuality of interest exists to the proper degree and both parties have given full and fair consideration to the case in point, there

will be few times that any such action on the part of management or labor will be necessary. Nevertheless, that is why it was stated earlier in this chapter that the partnership has certain definite limitations.

The foregoing concept would, of course, be subject to complete revision in a situation wherein the union shared equally with the management the responsibility for the successful continuation of the enterprise. Many managements, unfortunately, now find themselves in an untenable position in this respect. They have given away a great deal of authority during contract negotiations without bargaining for an equal amount of responsibility in return. Once lost, such authority is generally extremely difficult to regain.

In any bargaining prior to undertaking a joint approach to such a program the wise management will consider well the degree of responsible action it may expect of the union before it accedes to relinquishing any of its "residual" rights.

2. Policies Governing the Work of the Participants Must Be Clearly Stated Before Any Work Is Done

This involves not only such policies as are discussed in Chapter Five but also policies governing the manner in which the work will be conducted. Careful thought should be given to these policies to make them as complete and comprehensive as possible. At the same time, care must be taken to avoid commitments that may not be possible to keep. It is wise to adopt a conservative position in this respect so that it will be possible to do more than stated rather than less. Where doubts exist as to what may be done in the future, these doubts should be clearly stated with reasons given for the uncertainty of the forecast action.

3. A Standard Must Be Based Only upon Facts

Work standards must be based upon facts determined by careful, complete, and competent analysis. Any judgments exercised must represent the best judgment of the ablest technicians available. These individuals must not be subjected to pressures from any source that could be interpreted as attempts to influence their decisions in favor of one party or another.

Standards may be legitimately questioned only to the degree that further analysis is desirable either to support the standard or to provide the basis for making a change. If such an analysis supports the standard, it must remain unchanged. To permit a standard to be changed arbitrarily because of pressure exerted by a group is to destroy

the integrity of all standards and to cause them to be subjects of mistrust. Thus is destroyed the true foundation of the plan in question.

4. The Fundamental Reasons for Making the Study Should Be Fully Stated

That this should be done is important because it provides further protection against future misunderstandings. The reasons for making the study may be due to the company's poor earning record, the type of wage plan in use not being satisfactory, an effort to provide more stable employment, the elimination of waste to provide more money for the payment of increased wages, the competitive position of the company, and the like.

Here again the degree and detail of the discussion depend upon the nature of the reasons, the degree it affects the hourly employee, and the stage of development the practice of participation has reached in the plant. At this time the goals or objectives of the study are clearly defined and established. The program outlining the step-by-step progression towards these goals should be drawn up and agreed upon by all parties concerned. This not only will save time through proper planning of the work but will also tend to eliminate future misunderstandings.

VARIATIONS IN THE DEGREE OF PARTICIPATION

Obviously there can be no single plan or pattern for such participation even within a single plant, let alone in more than one plant. There are many types and degrees of technological changes and related projects, and they vary widely as to seriousness and difficulty. All of this means that they justify different administrative policies and procedures as regards their effect on the employees and on union participation in their solution.

The degree of participation may vary from that of a purely advisory and interested position to that of employee representatives working full time with the technicians in the effort to reach satisfactory solutions to the problems. Again this degree of participation depends on whether the change is major or minor. It could be said that there are two general types of studies that would involve union participation. They might be termed "regular" and "special." By regular is meant, for example, the normal or routine maintenance of a wage incentive plan or its extension to other operations in the same department. By special is meant a new or major project such as the relayout of a department,

the development of new works methods, the institution, or major revamping, of a wage incentive plan, or the like.

Each type probably would be handled differently insofar as union participation is concerned. Again, the degree of participation would depend upon the employees' measure of interest in participating beyond a "being kept informed point," and also upon the degree of maturity and confidence reached in this relationship between management and labor.

EMPLOYEE PARTICIPATION IN SPECIAL OR MAJOR TECHNOLOGICAL CHANGE PROJECTS. For the purpose of illustration let us assume that we are going to work with one department at a time rather than take the plant as a whole in one project. Then our overall program would take the following general form with both degrees of participation discussed.

1. General or Preliminary Managerial Discussions

A. Discuss thoroughly with the plant management and the department head and his assistants the objectives of the study.

B. Develop detailed program governing work to be done in the department. To be acceptable it must bear the approval of the department head in addition to the plant management and the industrial engineers.

C. Prepare in detail the approach to the employees of the department and determine fully the degree of employee or union participation it is deemed wise and desirable to encourage at this time.

2. Program When Employees Are Participating on an Advisory Basis and Are Kept Fully Informed of What Has Been Done and What Is Going to Be Done

A. Meet with all employees in the department to discuss fully the objectives of the study and how it is going to be conducted. This meeting should include a thorough discussion of the advantages to both labor and management that should result from the study. The policies under which the project will be carried forward should be carefully explained and the required assurances regarding the full protection of the employees under the study given in a clear concise manner.

The techniques and methods to be employed should be explained by the use of examples, motion pictures, charts, and the like. The employees should also be given to understand that their advice and counsel not only are desired but are also sought.

If it is so desired by the union officers and committee, this whole

program can be discussed with them alone before it is presented to all the employees. Under most circumstances this would be a desirable course to take and should be looked upon favorably by management.

B. Meet periodically with the employees as the study progresses. As progress is made and each phase of the program is completed, similar meetings should be held with all the employees to explain and discuss the results obtained. At this time the next step or phase should be fully discussed so that the employees are completely aware of what is planned.

Special effort should be made during these meetings to overcome any skepticism on the part of the employees. At the same time they should be encouraged to express any doubts or ask any questions they may have not only about the details of the study but also as to how it may affect them. This is the time to remove any doubts and fears that may still exist in the minds of the workers. These meetings should be conducted by the departmental supervision, assisted by the engineers.

C. Have regular daily contacts with departmental employees. As the engineers carry on their work in the department, they should talk it over with the employees they are working with and give full explanations of what they are seeking at that particular moment, and they should ask the advice of the workers. The departmental supervision should aid in these contacts, especially if it is the first contact with a particular group. It is by means of these day-to-day contacts that most of the misunderstandings, rumors, and misapprehensions can be cleared up. In fact it is not too much of an exaggeration to say that the success or failure of the entire project rests upon the success of the daily contacts between supervision, engineers, and the hourly employees.

D. Hold meetings at the conclusion of the program. Meetings have been held as each phase of the program was completed, and the changes and improvements are now made and installed. When these changes have been completed and the employees fully trained in the new methods of work, the next move is the installation of the incentive plan. Regardless of whether or not the employees are generally familiar with the type of incentive plan to be used, it should be fully discussed with them.

Here again we recommend that the plan and its operation be discussed with the union committee prior to the plan's being presented to the employees as a whole. Any misunderstandings that the committee members may have can be cleared up at that time so that they

will be in a position to support and to help explain the plan at the general meeting.

The standards, policies, bonus calculations, report forms, and everything else connected with the incentive plan must be fully presented and discussed. All questions should be answered and explained to the satisfaction of everyone concerned. Copies of the bonus standards and policies should be prepared for posting in the shop, or at least they should be made readily available to any interested employee.

It is recommended that these meetings be held at the start of the shifts so that, at their conclusion, the workers can go to their work places with the discussions and explanations fresh in their minds, and with the aid of the supervision and engineers proceed to prove the standards in actual practice. These first days are critical, and the engineer must stand ready to correct any omissions or errors that become apparent under actual operating conditions. There are certain to be some mistakes in any incentive installation, and the speed and fairness with which the mistakes are overcome have much to do with the reception and sustained approval it receives from the employees.

E. Have a permanent pattern for employee relations in regard to technological change. We know that no matter how thorough and painstaking a job has been done in modernizing and streamlining a department or plant, it will not remain static. There will be constant changes of a minor nature and occasionally a major change will occur. That is progress and we must seek it, because our model plant or department is only the best we can think of today. Tomorrow someone may devise a new machine or method that will make obsolete some portion of our process.

We must, therefore, maintain and foster our program of keeping our employees fully informed on current thinking and plans and seek their advice. This can be done by following the same pattern we have been discussing: by holding meetings with the employees when the matter is of sufficient importance; and by holding discussions with the union committee and individual employees on a day-to-day basis, as items come up that are of general interest but not important enough to justify a general meeting. When a change occurs that affects a standard of work, or a method of work, it must be discussed fully with all interested parties before any change is made.

3. Program When Representatives of the Employees Are Going to Be Working Partners on the Project

The only distinction between this approach to the problem and the one we have been discussing is that here we have representatives of

the employees working full time on the project as technicians. Otherwise the pattern can be the same, with the added impetus of having some of the fellow workmen of the hourly employees actually doing part of the development work.

Care should be taken in the selection of these hourly employees who will work with the engineers. Although the workers themselves should make the actual selections, the management should reserve the right to question any selection on the basis of the individual's experience and knowledge of the work in the department, and the degree of contribution he can make. This privilege would probably seldom be used, but it is important that the ablest employees who are eligible be chosen.

These employee assistants are taught to use the techniques and methods of the technicians. Thus they can contribute to the development of data and other information. In this manner they acquire at least sufficient knowledge of the techniques involved not only to understand them themselves but also to explain them to their fellow employees. One of the real values these employee assistants have is their knowledge of present methods and working conditions. Through this first-hand knowledge they can hasten the analysis and also aid both in preparing and in trying out the proposed new methods. They can also prove their value in helping to train the employees in the new methods and do much to convince them of the practicality of the new methods as well as the fairness of the incentive standards established for them. When the maintenance phase of the program arrives following the completion of the major project, these same men can be called upon when needed to assist the engineers and also to review changes made in methods and standards to aid in obtaining their acceptance by the employees as a whole.

When a management has reached the point where its industrial relations are on such a high plane that it can openly invite this type of participation, it would do well to consider it favorably. It has much to gain and little to lose when it has this type of a relationship with its employees, organized or not. However, should the union insist on introducing outside union technicians, then management should proceed with great caution.

It has been our experience and observation that our own employees have an entirely different attitude from outside union members, and they desire to do a thorough job when they are members of such a participating group. Our own employees are personally interested in the success of the plant because it is there that they make their living. The outside union members are not so interested, and are in

danger of being motivated by ideals and ideologies rather than by the desire of doing a thorough unbiased job. Then, too, they may not only be incompetent technicians but may also lack an intimate knowledge of the work performed in that department or plant.

Should the plant union member participants request that their international union specialists be permitted to review the joint committee recommendations in the offices of the plant, under ordinary circumstances it would be entirely satisfactory to do so. However, before a management agrees to go beyond that point, it should consider carefully the full import of such an agreement.

4. Suggestion System under Such Programs

If a plant has a regular suggestion system in operation it is important that a decision be made as to how it will be disposed of during such a study as we have been discussing. It is obvious that many suggestions made by employees would have already been thought of and planned for by the technicians or supervision. Yet it is difficult to convince any worker of this fact when his suggestion is involved. Then, too, when regular employees are working as members of the joint study committee, they will be developing many ideas that find their way into the final solution. This raises the question of how they should be considered in relation to the other employees and the suggestion system.

We believe that it is best to suspend the suggestion system completely during such a development period. This may be unfair to some workmen who turn in good ideas, but it may prevent many harmful and upsetting disagreements on the authorship of suggestions. Should there be any unusually fine suggestions, they could be singled out for some special reward.

An alternate method would be to suspend the regular suggestion system for the duration of the study and institute a special system. This special system would require a special committee to evaluate and adjudicate all suggestions offered in the light of the work of the joint committee. This special committe should contain employee members as well as management members, and its decisions should be final.

The type of procedure outlined in this chapter is one that has led to the successful installation of wage incentives in an encouraging number of instances. Through such a cooperative approach management and worker alike have an opportunity to develop an understanding and respect for one another's position. More important, they have an opportunity to develop a feeling of trust for each other. This is the most essential ingredient in any successful partnership.

CHAPTER SEVEN

Policies Governing Wage Incentive Payments to Insure Their Fair and Equitable Administration

In preparing and stating the general company policies that will govern incentive payments and the development of the bases for these payments, it is desirable to divide the policies into two parts. The first part deals with those general fundamental policies that state the bases for incentive work in the company. The second part deals with those general policies which govern the actual payment of incentive moneys and the control of those payments.

The following group of policies, given in outline form as they might appear in an installation manual, are designed to indicate the scope these policies should take and the form they might have. As recommended, they are broken down into two groups. Policies such as these should become an integral part of every operating manual governing a wage incentive installation. Copies of any changes made in any published policy should be made immediately available through the supervision to the employees affected.

I. General Basis of Incentive Plans

A. Purpose

In order to make it possible for the plant's employees to increase their earnings through their own effectiveness, and also for the com-

pany to maintain its position in the market for the sale of the products, it is extremely important that a continued effort be made to increase production output by the most effective utilization of labor and equipment. A wage incentive is a desirable means of accomplishing this dual purpose. The management desires to extend the mutual advantages of wage incentives as widely as can be done practically and economically.

B. Limitations to Application

The application of wage incentives must necessarily be limited to operations for which the management has determined, on the basis of Industrial Engineering Department studies, that

1. The operator or operators can definitely contribute to the realization of any one or more of the following objectives: (a) increased machine capacity; (b) improved material utilization; (c) increased utilization of labor, and (d) improved quality of product.
2. Practical standards can be established for a positive check on performance from the quantity and/or quality standpoint.
3. There are no such widely variable conditions encountered in the operation that the use of an incentive would be inequitable.
4. The incentive application is sufficiently simple for the employees to understand.
5. The incentive application can be economical and practical from the standpoint of the costs of determining the standard and administering the incentive application as compared to the probable savings which would be obtained.

C. Type of Incentive

In the majority of conditions, individual incentive, when practicable to install, seems to be the most satisfactory and productive type of incentive. When it is necessary to deviate from this general policy, however, an attempt should be made to keep any group or gang set-ups as small in number of members as practicable.

D. Coverage

All incentive installations should cover the entire work of the department as completely as seems practicable. This includes giving consideration and proper emphasis to such factors as quality, waste, spoilage, expenses, supervision, indirect labor, and excess costs of operation, in addition to direct labor.

It shall not be policy to place individuals on incentive whose production cannot be measured economically and controlled by direct standards either as an individual or as a member of a group.

E. Basis of Incentive Plan

The general policy of the company is that the Standard Hour Plan shall be standard throughout the company.

Bonus is on an accumulative basis for a full shift, bonus hours earned each day being added to the previous total of bonus hours earned. In the event that the standards have not been met for a shift, no penalty will be inflicted. All participants begin each new work day or shift with a clean record.

F. Personnel Eligibility

In determining whether an individual job on a particular operation shall be included in a group incentive plan for that operation *all* of the following provisions must apply:

1. The individual who holds the job must report to the supervisor of the operation to which the group incentive is applied.
2. The individual job must contribute directly to: (a) the processing of the material; (b) the movement of raw materials, materials or parts in process, or finished goods to, through, or away from the operation; or (c) the maintenance of essential operational records or equipment.
3. The individual must be a regular member of the group having the same working hours as the group, except for preparatory or shutdown work which may be done by staggering working hours for one or more regular members of the group.

G. Basis of Standards

1. Time Studies and Standard Data. Incentive standards shall be determined by the Industrial Engineering procedures of time and motion study, compilation, analysis and use of predetermined time data, and statistical analysis, by which means a sound basis and fair application are assured.
2. Percentage Bonus Allowance. The general policy of the company is that the standards shall be set so that it will be possible to earn 25 per cent bonus for a normal output above the break-even or average measured output established for a job. It is not the desire or intent of the company to limit bonus earnings to 25 per cent but to pay in the same full proportion for any output above normal.

3. PERSONAL, FATIGUE, AND DELAY ALLOWANCES. Personal, fatigue, and delay allowances are made for each operation, depending upon its characteristics. These allowances must be kept uniform between plants and departments for like operations.

4. QUALITY FACTOR. On all operations it is expected that the standard production rate will be attained at the standard quality performance. To provide for an economic balance of production versus quality at other than standard performance, it is frequently advisable to have a quality incentive combined with the production incentive. When meeting standard quality and production requirements, the combined incentives at incentive performance will pay 25 per cent incentive earnings.

H. Keyman or Supervision Incentives

Keyman or supervision incentives will be formulated when sufficient incentive coverage of a department has been obtained and proper consideration of all contributing factors has been given to warrant placing the supervisors on incentive.

I. Uses of Incentive Plan

The construction of the plan is such that it serves not only as a method for the payment of bonus and a measure of the effectiveness of an operation, but also as a basis for comparison of the effectiveness within and between departments.

J. Explanation to Employees

It is the policy of the company to explain fully the fundamentals of the incentive plan to all the workers affected by it at group meetings just prior to the installation of a new or revised plan. When these meetings are held it will be necessary to explain how the standard is developed and how the bonus is computed so that each worker will understand how to compute his own bonus earnings. It is advisable, and in line with company policy, to review fully with the worker any and all data used in establishing standards.

K. Analysis of Operations to Be Placed on Incentive

Before establishing work methods and standards, a thorough analysis should be made to improve methods and equipment, eliminate unnecessary elements of work, reduce fatigue, improve working conditions, and assure a minimum of wasted material. Where necessary, adequate relief, or shifting between jobs, should be recommended for fatiguing incentive jobs.

L. Method of Checking Effectiveness of Plan

To determine the general effectiveness of the plan and the analysis preceding its installation, an average preinstallation period is selected by the supervision and the industrial engineering department in order to learn the degree of increase in employee earnings and the reduction of cost.

This period serves as a base period or standard measuring period of employee earnings and labor and material costs, against which current earnings, labor, and material costs are compared.

M. Review of Incentive Plan Before Installation

Before an incentive plan is installed or any major changes made in an installation in effect, the department head involved and the chief industrial engineer will review the changes in detail with the plant manager and personnel manager. This should be done so that they may be fully informed as to the nature of the plan or changes and be in a position to offer suggestions.

II. General Policies Governing Operation of Incentive Plan

A. The Standard Hour Bonus Plan

The Standard Hour or 100 Per Cent Incentive Bonus Plan shall be standard throughout the company.

Under this plan the employee is paid a bonus for all the productive hours saved over predetermined measured standards. The bonus is on an accumulative basis for a full shift, hours earned each shift being added to the previous total of bonus hours earned. In the event the standards have not been met for a shift, no penalty will be inflicted. All participants begin each new work day or shift with a clean record.

Bonus is calculated and paid on the basis of incentive hours only. In calculating bonus earned, only work covered by standard time allowances, as stated and described on the standard authority forms, will be considered.

Work not covered by standards or such time classed as relief, spell, or waiting time shall be excluded from all bonus calculations and payments unless an exception is clearly specified in the approved manner.

Bonus earnings are calculated on the basis of the same hourly rate as is the regular base pay.

B. Approval of Installation

The chief industrial engineer of the plant, the plant manager, the department heads affected, and the engineer making the installation should approve the installation before it is made effective. (In multiplant companies where there is a general management staff, they should also approve the installation.)

C. Changes in Installation in Effect

Any recommended changes in a policy manual of procedure governing the wage incentive plan, once it has been installed, must be submitted to the plant manager and to the general industrial engineering division for approval.

Planned changes of a major nature in an old installation must have the same approvals before being made effective.

Emergency changes of a minor nature and normal routine maintenance changes in an approved installation may be made with the approval of the plant chief industrial engineer, with coverage on the changes being given the general industrial engineering division within a reasonable length of time and in the approved manner.

D. Reports on Earnings

Properly designed reports, to reflect individual earnings and results obtained, should be provided in each individual installation. Procedure must be instituted for posting results promptly. For example:

1. Daily bonus reports (before noon the following day).
2. Pay period bonus report (second day following the last day of the period).

E. Standards

1. Permanent and Temporary Standards

a. All standards are permanent unless otherwise specified. Permanent standards are not to be revised unless there has been a change in equipment, methods, or materials which affect one or more elements of the standard. In case of revision, only those parts or elements of the standard affected shall be revised.

b. Temporary standards will be superseded by a permanent standard when the reasons for their having been made temporary are removed, or another temporary standard may be issued if another temporary change is made. They may be revised or canceled at any time.

Temporary standards are, by their very nature, undesirable because

they imply the lack of a thorough study and application of methods improvement principles in advance of the establishment of standards. Therefore, the use of temporary standards shall be restricted; however, they may be established in accordance with the following conditions:

(1) Time limit. They may be established for only a fixed period of time, but may be established for an additional fixed period by the same approvals. They should be authorized for the shortest period of time that is reasonable under the circumstances. The total time for which a temporary standard is in effect, including extensions, should not under any circumstances be longer than six calendar months.

(2) Short runs. They may be applied to production of non-repetitive job orders of such small size that a complete, fully detailed study of the operation for the installation of permanent standards would be impossible or impractical. Should the same work be repeated at a later date, complete studies may be taken at that time and permanent standards established if conditions permit.

(3) Lack of industrial engineering service. They may be applied to operations when availability of Industrial Engineering service does not permit taking extensive studies before establishing a standard.

2. Complaint on a Standard. Any request for a check study on a standard must be made in writing, signed by the department head and his direct supervisor, and sent to the industrial engineering department. Figure 3 is a sample of the form to be used for this purpose.

3. Request for a Standard on a New Job. A request for a standard on a new job must originate with the department head. The standard is not to be established, however, until definite methods have been worked out. (See Figure 3 for form used.)

4. Placing Operations Covered by Standards on Non-incentive. An incentive operation to be worked as a non-incentive operation must have the joint approval, in writing, of the department head and the plant chief industrial engineer. This approval may be noted on the regular report of production to the bonus clerk.

5. Excess Standards

(a) Use of excess standards. When variables or conditions enter certain operations to the degree that a time longer than standard time is required to perform the operation, an additional allowance or standard is established to cover the condition, known and shown as an excess allowance. This is a measured allowance.

The use of an excess standard must be approved by the plant chief industrial engineer.

(b) Report on use of excess standards. At the end of each pay period, when excess standards have been used, an accumulated excess

THE MANUFACTURING CO.

To:_____ Location_____

Plant No._____

Department_____

Request for Time Study and/or Standard Authority

Date scheduled_____

New work_____ Time scheduled_____

Old work_____

Job description_____

Remarks _____

_____

Authority issued

Requested by_____

Issue No._____

Date_____ Approved by_____

By whom_____

FIGURE 3

report should be prepared showing the nature and total of all excess hours allowed and the expense involved. This report should be sent to the department head, plant manager, vice president of manufacture, and the general industrial engineering division.

F. Standard Authority (To use bonus standards)

These forms are made out only by the industrial engineering department and are the official authority to use the specified bonus standards. (See Figure 4.)

FIGURE 4

PERMANENT AUTHORITY FOR STANDARDS

OPERATION Cutting A style cases on No. 1430 cutter
OPERATION CODE 300-2
SHEET 1 OF 2 SHEETS
PLANT 3
APPROVAL
DEPARTMENT Corrugating
DATE June 16, 1958

SPECIFICATION OF WORK

Bonus Standards

"B" Flute cartons only—feed one sheet at a time on full cuts.

Class	Carton size (sq. in.)	Standard Time	Units
I	Over 600 to 1200	7.2 min.	100 cartons produced
II	Over 1200 to 1800	7.5 min.	100 cartons produced

Punch holes only—two fed at a time.

PI*	Over 600 to 1200 sq. in.	5.2 min.	100 cartons produced

* Class I only is covered. This punching occurs only on small cases that require removing punch on first operation to bring tuck flap cutters close together. Time study required on larger cases. No make-ready standards. This work done by department machinist.

Description of Operation

Standard crew—1 operator (male)
Layout and work place arrangement as specified on 4/23/58. See master record.

A. Operation
1. Lay up stock to feeder table (jogging evenly for ease of feeding).
2. Feed machine (one sheet at a time on regular cuts). Pick up one blank sheet with R. H., while L. H. removes one finished sheet from the machine and discharges it into hopper. Feed next sheet into machine with R. H., L. H. holding sheet in position, releasing R. H. for securing next blank sheet. (Operator is able to utilize only every second stroke of the machine for there must be one idle stroke for stripping.) Feed two at a time only on punched holes.
3. Jog finished pieces and stack neatly on skid.
4. Lay waste sheets aside on skid.
5. Shovel trim from bin at rear of machine to waste truck.
6. Move loads to the work place from the storage area with hand truck.
7. Move loads to the storage area from the work place with hand truck.
8. Oil machine as required.

B. Make ready
Operator has no part in make ready. Make ready done entirely by the department mechanic.

Equipment

1—No. 1430 cutter with special knives for cutting A style cases
Reeves variable-speed drive, max. speed 105 r.p.m.—min. 26½ r.p.m., recommended 66 r.p.m.
1—Feeding table built over machine
1—Floor mat for operator
1—Crescent wrench (adjustable-end stop)
1—Oil can
1—⅛ in. Allen wrench
1—Mechanical-lift truck available
1—10 in. grain-type shovel with 30 in. handle

FIGURE 4 (Continued)

Materials

"B" flute cases slotted at printer for A style cases (not flapcut). Cartons previously flapcut retard this operation; therefore, flapcutting is to be performed afterward.

Specifications

As per instructions on factory order, or sample furnished.

The operation number on these forms is the code number of the operation.

The standard time values given on the standard authority are break-even time values, or zero bonus point (0 per cent).

The specification of work gives a description of the work to be done and any reference to other sources of data that may be necessary.

This authority, to be official, must bear the signatures of the department head, plant manager, and plant chief industrial engineer.

G. Method of Handling Operator's Time on New Jobs Which Require Time Studies

Operators will be paid their guaranteed hourly base rate on new jobs until such a time as time studies have been made, a schedule of standard times developed, and the standard authority showing the standard time allowed is delivered to the foreman. After the standard is determined, with the consent of the operator, it may be made retroactive to the time the operator started on the job.

H. Method of Handling Operator's Time on New Jobs to Which the Present Schedule of Standard Time Allowances Applies

On jobs that do not have a standard established by standard authority, but are covered by a schedule of standard time allowances or standard data tables already in use, the operator will be placed on incentive upon receipt of the assignment by him. He will be notified when the task is assigned to him that the standard will be given him at once. When at all possible, standards will be developed for all jobs before they are assigned.

I. Allowances

1. Special Allowances and Exceptions. Special allowances and exceptions to established bonus standards and allowances that are not covered in the manual of procedure governing the installation must receive the approval of the general industrial engineering division before being made.

Decisions which require immediate action will, of course, continue to be made by local management with the provision that the decision is subject to final approval by the general industrial engineering division before a policy is permanently established.

2. ALLOWANCES FOR TRAINING EMPLOYEES. Allowances are to be made for operators to learn the proper method and acquire the proper skill to perform an operation in the standard time.

a. "Average earnings" rating scale for experienced operators.

(1) General. A bonus rating scale or "average earnings" based on the individual's average bonus earnings for the past twelve weeks (to date) will be established for each worker. This average is determined by dividing the total net bonus hours earned by the total actual incentive hours worked by the operator.

Figure 5 is a sample of the form to be used in developing the average earnings rating scale. The department supervisor fills in the authorization form (Figure 6) for the payment of the average earnings rating scale and sends it to the plant chief industrial engineer for approval, who in turn sends it to the bonus clerk to be used in computing the bonus.

(2) Transfer to unfamiliar job. When an employee is temporarily transferred from a familiar incentive job to an unfamiliar one, for the convenience of the management and when his regular work is still available, he shall be guaranteed his average earnings rating for the specified training period. This average earnings applies only when the employee is working on an operation for the first time or when a long period has elapsed, so that the employee may have forgotten the task. In the latter case the allowed training period is shortened, based on the judgment of the plant chief industrial engineer and the department head. The operator is notified at the start of the job how long the average earnings will apply.

(3) Discontinuance of average earnings. In the event that such a worker earns more than his average earnings rating, he will receive his actual earnings. When this point is reached, the average earnings must be discontinued automatically.

(4) Inexperienced worker with experienced worker. In the event that an inexperienced man is placed with an experienced operator or group for training, the experienced operator or operators are guaranteed his or their average earnings rating for the specified training period. As the amount of influence an inexperienced operator's production may have on the group's production varies with the particular set-up, the application of the average earnings under these conditions

THE MANUFACTURING COMPANY

Department_____

Plant No._____

SHEET_____ OF_____

Location_____

AVERAGE EARNINGS RATING SCALE

Employee	% Bonus — Period Ending		% Bonus — Period Ending		% Bonus — Period Ending		% Bonus — Period Ending		% Bonus — Period Ending	
	This Period	Av. Last Six Per.	This Period	Av. Last Six Per.	This Period	Av. Last Six Per.	This Period	Av. Last Six Per.	This Period	Av. Last Six Per.

FIGURE 5

THE MANUFACTURING COMPANY

To:_____ Location _____

Plant No._____

Department_____

Authority for Application of Learner's Curve or Average Earnings Rating Scale

Learner's Curve_____

Average Earnings Rating Scale_____

Name_____ Clock No._____

Remarks _____

_____

Hours to Apply_____ Approval_____ (Foreman)

Approval_____ (Industrial Engineer)

FIGURE 6

should be tempered by the judgment of the plant chief industrial engineer and the department head.

(5) The supervisor's participation in the average earnings. Supervisors who normally participate in the average bonus earned by a number of operators receive only the per cent bonus actually earned. They receive no benefit from the operator's average earnings. At times, such as slack periods when supervisors are temporarily working on direct labor, they receive no average earnings based on their bonus earnings as supervisors. They may, however, receive the benefit of an average earnings on their past direct production earnings.

b. Learner's compensation curve.

The purpose of this curve is to minimize for new employees the loss of bonus they or their group may suffer because of their un-

familiarity with the work. The form illustrated in Figure 6 serves as the authority for applying this curve.

The curve to be used is (for 0 to 30 actual standard minutes per hour add enough standard minutes to equal 45 allowed standard minutes per hour):

Actual Standard Minutes Produced per Hour	Allowed Standard Minutes per Hour	Actual Standard Minutes Produced per Hour	Allowed Standard Minutes per Hour
31	46.0	46	53.5
32	46.5	47	54.0
33	47.0	48	54.5
34	47.5	49	55.0
35	48.0	50	55.5
36	48.5	51	56.0
37	49.0	52	56.5
38	49.5	53	57.0
39	50.0	54	57.5
40	50.5	55	58.0
41	51.0	56	58.5
42	51.5	57	59.0
43	52.0	58	59.5
44	52.5	59	60.0
45	53.0	60	60.0

Ordinarily there is no occasion to use this curve except when a considerable amount of instruction or practice is required to obtain effective effort. Its application in any particular case should be on the judgment of the department head and the engineer handling the assignment. Standard learning periods are developed for applying this allowance.

3. Training Periods. Training periods are established for all operations to govern the length of time that the above allowances apply. An estimate is made of the time required to train a normal operator in the proper method of performing the operation and for the operator to reach break-even production.

For operations with no records of training the plant chief industrial engineer and the department head set a temporary standard. When sufficient data have been compiled, they set a permanent training period for the operation. These data are accumulated on a record of average earnings and "learner's curve" data.

A copy of all permanent training periods is furnished the general industrial engineering division for central file data. Until definite guides have been established, all permanent training periods should be approved by the general industrial engineering division to maintain uniformity among plants.

Any time, incentive or non-incentive, spent learning an operation is applied against the operator's allowed training period for the operation.

4. DELAY ALLOWANCES. Short non-recurring delays, up to and including 6 minutes, which are not under the control of the incentive workers, are included in the standards. Any continuous delay over 6 minutes, not controllable by the worker, is allowed in full. In the event a series of short intermittent delays of less than 6 minutes occur, the supervisor should make due allowance for them on the Daily Report of Operation (Figure 7). The payroll department makes a summary report (Figure 8) of all delays during a pay period.

5. ALLOWANCE FOR SAMPLES, EXPERIMENTAL AND NON-STANDARD JOBS. When an item is being run for which, because of lack of standardization of methods, no bonus standards or allowances have been established, it is classed as experimental or non-standard work, and as such is excluded from all bonus and efficiency calculations. The actual time for running such an item is also excluded from bonus operating hours.

J. Bonus Accounting

1. RESPONSIBILITY. Since the plant accountant is responsible for the accuracy of all bonus accounting, the plant chief industrial engineer should make certain that some individual, designated by the plant accountant, is thoroughly trained to handle properly the bonus accounting involved in the incentive plan.

2. AUDIT

(a) General. All bonus computations are subject to periodic audit by the general accounting division.

(b) Plant. The plant accountant and the plant chief industrial engineer should also periodically audit the bonus accounting to satisfy themselves that all policies are being adhered to and that the plan is functioning properly.

3. PAYMENT OF BONUS

(a) Time. It is the policy of the company that, whenever possible, all bonus earnings shall be included in the check with the hourly earnings for the same period.

(b) Duplicate bonus. Duplicate bonus must not be paid.

If operators or gang leaders hold over on the following shift, they are to receive no bonus on this time *unless they replace a regular operator or gang leader.*

If an employee, hourly or salary, participates in more than one bonus plan, the sum of his per cent participation should not exceed one full share (100 per cent).

THE MANUFACTURING COMPANY

DAILY REPORT OF OPERATION

Plant No._____ Department_____ Date_____

Clock No.	Name	Base Code and Operation No.	Item	Bonus		Time		Quality	Standard Time Unit	Standard Hours	Actual Hours	Remark
				Yes	No	Start	Stop					

FIGURE 7

THE MANUFACTURING COMPANY

Date_____

Plant No._____ DELAY AND WAITING TIME REPORT Copy to:

Location_____ Period Ending_____

Dept._____

Delay Code	Date — Time in Hours and Tenths of Hours																Totals	Remarks
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
700–1																		
700–2																		
700–3																		
700–4																		
700–5																		
700–6																		
760																		
770																		
780																		

Total hand work hours this period (incentive) _____

Total machine hours this period (incentive) _____

Signed_____

700–1 Machine breakdown
700–2 Waiting for stock
700–3 Waiting for instructions
700–4 Waiting for new job
700–5 Power failure
700–6 Dispensary time
760 Excess – Overtime premium
770 Excess – Average earnings
780 Excess – Beginners (learners)

FIGURE 8

(c) Payment of overtime premium to incentive workers. When an incentive worker is being paid an overtime premium, the hourly rate upon which the overtime premium is calculated is equal to his total earnings for the week (including incentive and non-incentive work and bonus), exclusive of overtime premium, divided by the total actual hours worked on incentive and non-incentive work.

This procedure conforms with the provisions of the Federal Wage and Hour Act and the Walsh-Healy Bill, both of which state further that the calculation shall be for the current work week.

EXAMPLE

Calculation of Overtime Premium and Total Week's Earnings:

Total actual hours worked in week (on incentive)	25
Bonus earned on incentive hours	20%
Total actual hours worked (day rate, non-incentive)	20
Total actual hours worked—incentive and non-incentive	45
Hours worked overtime	5

Hourly base rate = $2.00

Calculation of Total Earnings Exclusive of Overtime Premium:

For hours on incentive 25 × $2.00	$50.00
For bonus on incentive hours 20% × $50.00	10.00
For hours on non-incentive or day work 20 × $2.00	40.00
Total earnings exclusive of overtime premium	$100.00

Rate upon which overtime premium is paid:

$100.00 ÷ 45 hours = $2.22 per hour

Overtime Premium:

$$5 \times \tfrac{1}{2} \times \$2.22 = \$5.55$$

Total Week's Pay, Including Overtime Premium $105.55

Overtime is paid for all hours over 8 continuous hours worked per day or over 40 hours worked per work week, whichever is the greater. If in the above example the cumulative hours worked in excess of 8 hours per day were 6 hours, then the overtime calculation would be:

$$6 \times \tfrac{1}{2} \times \$2.22 = \$6.66$$

(d) Payment for attending meetings. When an hourly paid employee attends a meeting planned and instituted by the management of the company, the time spent in the meeting is considered non-incentive work time, whether or not the meeting is voluntarily attended. The

calculation of earnings above applies, the employee being paid his regular hourly base rate for the hours involved.

(e) Minimum fraction of hour for bonus purposes. Hours worked on incentive are recorded to the nearest minute, but bonus earnings are calculated on the basis of the nearest 6 minutes.

(f) Payment of bonus when more than one hourly rate is involved in the shift. Bonus is computed on the employee's guaranteed base rate for the job.

When a worker on incentive works on different jobs that involve different hourly rates, his bonus earnings are calculated separately on each hourly rate by applying the hourly rate to the bonus hours earned. The resultant individual earnings, or earnings and losses, are totaled to arrive at the net bonus earnings for the shift.

EXAMPLE: EMPLOYEE 4858

Bonus hours earned 1½	× $2.00 =	$3.00 bonus
Bonus hours earned 1	× $2.15 =	$2.15 bonus
Total bonus earnings	=	$5.15

4. Payment of Bonus When Individual Works as Member of More Than One Group During a Shift in the Same Department. The percentage of bonus for each group for the shift is calculated and applied proportionately to the number of incentive hours the individual worked in each group. The hours earned or lost in each group are then added to determine the total hours earned for the shift.

EXAMPLE

Incentive hours worked with Group A = 5.0	× 20% bonus =	1.00
Incentive hours worked with Group B = 3.0	× 10% bonus =	.30
Total incentive hours worked	8.0	
Bonus hours earned		1.30

Bonus hours earned 1.30 ÷ Total incentive hours worked 8.0 = 16.2%

5. Production on Which Bonus Is to Be Paid. Only production meeting the established specifications will be counted in calculating the bonus earned. Any deviations from this rule must be approved by the department head and the plant chief industrial engineer.

6. Bonus Losses

a. Bonus losses incurred in a department must be deducted from bonus earned in the same department during the same shift before

arriving at net bonus earnings. Bonus losses incurred while working continuously more than regular shift hours, such as a double shift, may be held separate from all other bonus earnings or losses at the discretion of the plant chief industrial engineer.

b. Bonus losses incurred in one department must not be deducted from bonus earned in another department.

c. At the end of the pay shift *all* net bonus losses are canceled.

7. Terminations and Transfers of Employees (Hourly and Salary)

a. When an employee's job is terminated, all bonus payable should be paid immediately, preferably at the time his final wage check is issued.

b. In case of transfers to another plant, all bonus payable should be paid to the employee at the time of transfer.

c. If the employee who is transferred or whose job is terminated participates in a keyman incentive, an equitable and fair adjustment is made.

d. If a salaried employee is transferred temporarily to assist another plant, he is paid the regular bonus earned by his home plant.

e. In the event that a salaried employee is visiting another company plant for educational purposes, he receives his regular bonus, except when it is necessary to replace him and pay bonus as a result of his absence. In other words, no duplicate bonus is paid.

8. Bonus Paid for Reporting to Work When No Work Is Available

(a) When no work is done. When an employee reports for work and finds no work available, he is not paid a bonus even though paid for a specified number of hours for reporting to work.

(b) When some work is done. When an employee reports for work and actually begins work at the start of a shift, and works fewer than the minimum hours specified for that plant under such circumstances, he must be paid for that minimum number of hours. This pay includes bonus earnings if it is an incentive job, these bonus earnings to be calculated on the basis of the average for the shift or pay period, whichever is greater.

(c) Exceptions. In the event that strikes, stoppages in connection with labor disputes, breakdowns of equipment, or acts of God interfere with work being provided, the provisions for payment of bonus as given under paragraph 2 do not apply.

9. Issuance of Bonus Earnings. The general rule is that bonus earnings are included in the regular pay check, under the same pro-

cedure established by the general accounting division for the company in the preparation of wage checks for hourly employees. These bonus earnings are shown separately from the hourly earnings in a box provided on the check for that purpose. This enables a man to see exactly what his bonus earnings were for the pay period.

In all cases bonus earnings payable are computed by the plant accounting department.

10. Participation Based on Average Department Percentages. Bonus payments to all hourly employees, including hourly supervisors, should be computed on actual hours worked. However, when actual hours worked under this type of participation exceed 8 hours per day, then only 8 hours are used in computing bonus payable.

This practice, however, does not apply to employees who put in more than 8 hours a day as a result of substituting for absent employees. In that event, they are paid bonus on such additional hours.

The purpose of this policy is to avoid paying bonus for hours when the department or crews are not working. In the event that the department or crews work overtime, the hourly supervision and other hourly employees participating on the average of the department would then participate on the additional actual hours worked.

It is not the intention of this policy to limit employees' bonus participation to 8 hours when their regular duties require more than 8 hours to perform and the basis or reason for their participation remains unchanged. Such situations are in the minority and should be handled in individual installations as they arise by providing proper exemption.

11. Status of Participants. Once an employee participates in bonus, it is difficult to remove him from future participation when the job does not change. Therefore, any proposed elimination of participants should be decided by the plant manager.

As stated, these policies are not intended to be all inclusive or designed to fit all installations. They are, however, indicative of the type and nature of policies that must be designed to govern a wage incentive installation.

CHAPTER EIGHT

Base Rates and Work Methods

For the installation of any successful incentive plan, it is important to have established an equitable basic rate structure and to have attained a reasonable standardization of work methods. Unless any inequities in basic wage structure have been eliminated before wage incentives are established, the incentive may well accent them. Unless the jobs are standardized, the maintenance of equitable standards of performance will be extremely difficult.

Much of the work that is required for the establishment of a sound rate structure is concerned with the detailed analysis of the content of each job. This work is known as job analysis. Similarly, the work of standardization of work methods is known as methods analysis. Job analysis provides much information that is useful for the work methods analysis which normally follows. Methods analysis and improvement may also result in changes in job content. It is, therefore, essential that there be the closest cooperation between the job analyst and the methods analyst.

The problem of establishing a sound basic rate structure which will stand up to the comparisons to which it is to be subjected is a difficult one. The following discussion is intended to provide only a brief outline of the magnitude of this problem, together with a systematic approach to its solution.

Basic Rate Structure

This basic payment for work performed is usually called the base or job rate. Such a rate should be established for each operation in the plant and grouped by class of operation. The establishment of equitable compensation for the performance of each occupation and operation in a plant is not a simple problem. It requires the best thought and effort available. It must not be left to chance or to the uncoordinated opinions of supervision and department heads.

An equitable wage or rate structure must meet several requirements. It must determine by job analysis what are the jobs or occupations in the plant and what distinct measurable classes of each exist. It must relate by job descriptions and job evaluation the value of each job and class of job to all others within the plant itself on a scalar or class basis. It must relate the value of all jobs and classes of jobs to wages paid for like work in the community and in the industry as a whole in order that rates may be kept in balance and the plant remain competitive for obtaining good workers. It must take into account the ability of the company to pay. The fundamental question that must be answered is the rank or relation of each job to all others in the plant. All other considerations rest upon the successful determination of this basic foundation.

In the past, the value placed on jobs has been established in many ways and influenced by many and varied factors. When the foreman alone valued the jobs in his department, he may have kept them low in an effort to be a low-cost department. The employer, too, may have looked upon wages as the answer to most of his employee relations problems and used them freely to answer complaints and grievances, recognize ability, length of service, and other extraneous factors. The pressure of unions has induced inequalities of different types, depending largely on whether they are craft or vertical unions, and whether or not there is more than one bargaining agent in the same plant.

DEVELOPMENT OF A RATE STRUCTURE PROGRAM

Keeping in mind that the purpose of a job evaluation and hourly rate structure program is to provide equitable compensation for all work performed based on the requirements of that work, we can outline the attaining of that purpose generally in these steps:

1. The Development of an Adequate Plan of Job Evaluation and the Establishment of the Method of Approach

There are many plans of different complexities and degrees of satisfaction in use today. One that has proved to have a high degree of acceptability involves the combining of the job ranking or classification system and the point evaluating system. The two approaches complement each other, and a more satisfactory result should be obtained by their combined use than by their sole individual use, for both the word definitions and the numerical definitions guide the analyst.

2. The Selection of Key Jobs in the Plant to Serve as Bench Mark Jobs in Evaluating All Jobs

These jobs are ordinarily selected on the basis of stability as to duties and requirements, general frequency in industry, their being recognizable and familiar to almost everyone in the plant, and inclusion of a substantial portion of the hourly personnel in the plant.

3. The Preparation of Detailed Job Descriptions First on the Key Jobs and Then on All Others

The answer being sought is job content—what is the job? The description must present a clear picture of the function of the job and a record of the significant characteristics on which is based the evaluation of the job. The characteristics or factors on which the job is evaluated usually include the following:

A. Training and experience required.
B. Mental abilities required.
C. Complexity and variety connected with the job.
D. Dexterity and physical skill required.
E. Responsibility for care of material or product.
F. Responsibility for equipment or process.
G. Responsibility for safety of others.
H. Responsibility for leadership.
I. Physical effort required.
J. Mental effort required.
K. Safety and health hazards.
L. Working conditions.

4. Ranking and Evaluating First the Key Jobs and Then All the Other Jobs in the Plant

It is here that the relative values are determined for each individual job and then for all jobs in relation to each other from a job content

and requirement standpoint only. Money as yet has not entered the picture. If money is considered here, then immediate comparisons with present rates becloud the issue to a serious degree.

5. The Preparation of a Wage Scale Based on Going Rates in the Plant, Industry, and Community Is Now Required

This wage scale is first tested against the key jobs, at which time its adequacy is determined. Once established, it is applied against all the jobs in the plant in accordance with their previously determined classifications. These rates then become the amount of money paid to anyone who works on that job and can meet the minimum requirements of the job.

In recent years the added use and increased cost of the so-called "fringe benefit" has further complicated the problem of developing meaningful comparisons needed in establishing an equitable base rate structure. Fringe benefits would, of course, affect the intracommunity and intraindustry comparisons rather than the intraplant comparisons. Such considerations as holiday pay, vacation pay, profit sharing, year-end bonuses, pension and thrift plans, life insurance payments, etc., amount in some cases to over one-third of the total payroll cost. In some cases a dollar's worth of fringe benefits may have an actual value of more than a dollar to the employee. For example, a dollar paid into a pension fund for future interests of the employee may be easily worth $1.50 in pay because of the income tax provisions relative to such retirement funds. Moreover, in terms of employees' satisfactions such fringe benefits may again have a greater value to the employee than a relative amount in direct pay. In some cases, however, a dollar spent in this fashion by the company is probably worth less in terms of employee satisfaction than a dollar spent in direct pay.

Since there seems to be no rational means of evaluating a relative dollar's worth of fringe benefits, about the only alternative is to rate a dollar so spent equal to a dollar's worth of pay, and to draw a separate set of curves for base pay and for total pay when making industry and community comparisons.

There are many secondary uses and results of a sound rate structure program. There is the use of the job descriptions for selection, hiring, and training purposes. There are the development of a definite plan of promotion from one job to another, the development of standard job titles, and the encouragement of better supervision. The important point is that a fair wage has been established for the performance of work. This fair wage can be used as the basis upon which incentive

payments can be made. These incentive payments are to be based on performance against standards alone and are in no way affected by or related to the content of the job in question.

RELATION BETWEEN WAGE INCENTIVES AND RATE STRUCTURE

In the past, incentives were sometimes used as a means of increasing a man's earnings without changing the base rate of the job when that base rate was considered to be too low. That misuse of the incentive idea not only contributed to the loss of favor for incentives but also seriously complicated and distorted the base rate structure in the plant.

Incentives and rate structures must be kept entirely separated in their preparation and determination. The rate structure analyst has no interest in whether or not the job will be placed on incentive because that point should have no bearing on the proper evaluation of the job and the establishment of the base rate for it. The engineer installing the incentive plan has no interest in what the base rate of the job is since it has no bearing on the establishment of the proper standard. Should the incentive plan be piece rates, then the engineer obtains the rate structure after he has established his standards and converts these standards into terms of money, using the rates shown in the rate structure.

If both the rate structure and the incentive plan have been accurately and equitably established, we have the ingredients of a successful and harmonious wage practice and experience. They must be not only acceptable to, but also supported by, both the supervision and the hourly employees, who must believe in them. The best way to achieve this is to make the supervisors and employees major partners in their development.

Methods Study

Often in the past, when it was felt necessary to reduce prices or lower costs, one of the first things thought of was to reduce wages. Realizing that this approach also reduced purchasing power, as well as causing labor unrest, employers have long sought other means. The idea of cost reduction through waste elimination was explored and has since taken such firm root and experienced such growth and acceptance by both management and labor that the reduction of wages to meet falling sales or rising costs would now be a measure only of desperation.

The most powerful techniques now available to management for the elimination of waste are the techniques of methods study. Methods study may be called, in part at least, by various names such as methods analysis, motion study, work simplification, job standardization, or value analysis. All require the analysis of existing methods, the synthesis of new methods, and the evaluation and utilization of new methods. Methods study, then, *has to do with the analysis of work to be performed in order to reduce it to its simplest accomplishment.* This analysis may result in the elimination of the job in question, its combination with other jobs, or its simplification through the elimination of waste effort and motions. It is here that the great savings through this form of cost reduction are obtained.

No enlightened management today expects an incentive plan of itself to increase operating efficiency. Methods study has repeatedly shown that the increase in productivity that can be obtained from an increase in the level of effort of the worker is very limited. On the other hand, the proper combination of work methods, motivation, training, and all the other attributes of a sound methods program can result in virtually limitless increases in productivity.

The primary purpose of an incentive plan in this connection, then, becomes one of providing some of the motivation for the individual to sustain a level of productivity obtainable through the utilization of such a program. It then becomes a sustaining rather than an attaining mechanism. This distinction should be kept in mind at all times.

Although the use of methods study has become widespread, its full possibilities in industry as a whole have yet to be explored. Progress has been and is being made, but the period of its greatest growth and application still lies ahead.

Problems in the Use of Methods Study. The major obstacles in the way of methods study in the past have been a lack of appreciation and understanding of its possibilities by both management and labor, a lack of trained engineers, and the opposition of both supervision and labor to it as a major factor in technological change. The manner and timing of its application often have had much to do with its lack of acceptance. The disruption of skills, the de-emphasis of the importance of a job, and the learning of new methods of work have caused opposition and confusion.

The present practice of making both supervision and hourly employees major factors in the development of such a program has been important in its recent rapid growth. Then, too, improved training practices and techniques have aided materially in overcoming operator resistance to the new methods. The education of supervisors and key

hourly workers in the possibilities of motion study, plus a sound policy designed to minimize the economic effect of the results obtained to the individual worker, have been important and essential steps.

The growing practice of a number of companies to submit all new operations and processes to a thorough study before their installation, so that the simplest and best-organized methods that can be devised at that time are included in the original installation, is doing much to reduce the degree and amount of change made in established work methods. This is desirable from a labor relations standpoint and is decidedly good practice not only from an operator response and training aspect but also from a rate structure and incentive viewpoint. Under this practice the possibility of changes in job content or performance standards within a relatively short period of time is minimized.

RELATION BETWEEN WAGE INCENTIVES AND METHODS STUDY

The ideal most plant managers seek is operating a high-wage, low-cost plant. There are many factors which enter into attaining that condition, but one of the most important is waste elimination. When an employee is hired he is selling to the employer his skill, knowledge, and effort. He has only so much of each to expend in a given period of time in terms of effort. If part of this is spent on ineffective or unnecessary work, it is sheer waste. Therefore, it is management's responsibility to analyze thoroughly all work performed to reduce it to its simplest terms and so obtain maximum utilization of the effort purchased from and expended by his employees. Thus the employee has the knowledge and the satisfaction that he is doing effective work, and one of the principal ingredients of a low-cost, high-pay plant is at hand.

The relation between incentives and motion study is here shown in sharp relief. The foundation of a wage incentive plan is the standard work requirement. This standard is based, or should be, on careful work measurement by time study. The time study analyst measures the work on the basis of the manner in which it is being performed. If the work is not fully organized, if it has not been subjected to the searching analysis of motion study, then there is certain to be much waste effort and many waste motions inherent in the manner in which it is being performed.

The time study analyst under such circumstances is forced to attempt to evaluate work performed under a variety of methods, with varying amounts of unnecessary and ineffective work present. Standards set under these circumstances are certain to force some of the workers,

at least those who themselves have not worked out simple motion patterns, to work faster and perform all elements of the operation at a higher speed, including those elements which should not be in the operation. This has in the past led to the cry of "speed up," and rightly so.

When the operation has been analyzed and simplified, and the operators trained in the new methods and following them, then the time study analyst is in a position to do a better job. He does not have to cope with a variety of methods and unnecessary or ineffective motions. He is in a position to establish a reliable standard and one that, when coupled with a wage incentive plan, offers financial encouragement for the worker to follow the new method, to prevent old waste motions from creeping back in, and to maintain or better a standard output of acceptable quality with a minimum of waste material and tools.

Although it is difficult to lay down an absolute policy, since some exception can always be cited, nevertheless a sound one is: *No standards shall be established on an operation for incentive purposes until that operation has been subjected to a study involving the use of these methods improvement techniques and the result of that study placed into effect in a satisfactory manner.*

CHAPTER NINE

Work Measurement

The success or failure of the incentive plan depends primarily upon the fairness and consistency with which the performance standards are set and whether or not they are guaranteed against unsupportable and unjustified changes. Other factors are important but the heart of the plan is the standard. Every worker must know and believe that his task requirements are comparable within reasonable limits with those of every other worker. He must know that, regardless of the part or job he is assigned to work on, the requirements are comparable within those same reasonable limits with any other part or job that may be assigned him. He must know that, regardless of his performance under those standards, if all conditions remain the same as specified at the time the standards were established, the standards will not be changed.

To be able to give a worker those assurances obviously requires that the standards be based upon facts. The only way these facts can be gathered is through careful detailed analytical studies. They cannot be based on past production records. They cannot be based upon rumors of what other plants are doing. They cannot be based upon the estimates or unsupported judgments of any individual or groups of individuals, no matter how experienced they may be in their knowledge of the work to be performed. The history of wage incentives is strewn with the wreckage of plans based on just such foundations as these.

No matter how well intentioned the individuals responsible for the plan may be, they cannot overcome the inherent complexities and variables that are part of production with anything other than measured facts.

We have discussed the importance of motion study in this picture so we can assume that the operations have been simplified, organized, and the operators trained in the new methods. We are now ready to establish standards of performance governing that work. These standards are not to be what a superior worker or a below-average worker can do but what we expect a normal worker to do in the performance of his job. This worker must possess the required normal physical, mental, and skill attainments specified for the job. These standards must be set on a fair, honest, and equitable basis, not requiring excessive concentration and exertion but at the same time requiring an average day's output.

TECHNIQUES OF WORK MEASUREMENT

Since Taylor's day the development of standards has been known as time study. However, because many people think of time study as including only stop watch time study, the term "work measurement" is perhaps more useful since it is now associated with the more modern techniques, as well as with basic stop watch time study.

No attempt is to be made here to cover work measurement in detail beyond a brief discussion emphasizing the absolute necessity for management to use whatever valid techniques are most suitable for its needs, and further to re-emphasize the necessity for having available competent technical help. This implies technicians capable of using, in addition to the variety of time measurement devices now available, such techniques as mathematical and statistical analysis involving multiple factor analysis, graphical analysis, correlation analysis, and work sampling. They should be competent to develop and use predetermined time systems, both macroscopic and microscopic, and should know when to use these techniques, their limitations, and the kind of results that may be expected from their use.

Simply stated, work measurement consists of three phases:

1. Determining the actual performance time.
2. Determining the proper performance time.
3. Determining proper allowances.

Some valid criticism has been leveled at the first and last phases of work measurement, but the major criticisms have been reserved for the techniques used for the second.

It is obvious that the ordinary stop watch is not a suitable time measurement device for all jobs. Obvious also is the fact that there may be some human errors induced by this method. The solution to these criticisms are equally obvious. More precise time measurement devices, such as the micromotion camera, decimal minute camera, and tape recording machines, may be used when justified to completely eliminate these complaints.[1] More serious is the complaint having to do with the validity of the sample taken. There is no excuse for any competent industrial engineer to overlook the statistical implications of the data collected. He should, in fact, design his study to produce reliable data, or at the minimum to indicate whenever the data is unreliable. He should then refrain from using any but reliable data.

Although allowances are limited cause for concern, partly because they represent a numerically smaller portion of the cycle time, they should be developed with care. These allowances are generally of three kinds, usually called miscellaneous delays, personal, and rest. The miscellaneous delays can and should be developed from a statistically valid sampling procedure, such as work sampling. The personal and rest allowances can generally be standardized in terms of the type of work. A reasonable consistency throughout the plant can then be obtained relative to these allowances.[2] Since it has been demonstrated that the allowances themselves will likely have an effect upon the performance rating used, these complaints can largely be carried over into the discussion of the judgment factor.

THE JUDGMENT FACTOR IN TIME STUDY. The major bone of contention regarding time study is the adjusting of the study to normal operating conditions and normal operating methods and pace in comparison with those witnessed and recorded during the study. This adjustment is primarily a matter of judgment on the part of the analyst, for he must estimate the extent to which the operator or operators studied have deviated from the analyst's concept of standards. It is obvious that this variable becomes all important in establishing a standard, and yet under existing methods and knowledge we must expect an average error ranging from 5 to 10 per cent, depending upon the nature of operations studied—and even experienced and competent analysts.

This margin of error and the known lack of uniformity between analysts have been sources of considerable concern to industrial engi-

[1] J. Wayne Deegan, "Basic Time Study Practice and New Techniques," *Proceedings*, Fifteenth Annual National Time and Motion Study and Management Clinic, sponsored by the Industrial Management Society, 1951, pp. 3–4.

[2] Matthew A. Payne, *The Fatigue Allowance in Industrial Time Study*, 1949.

neers and have been the subject of strong attacks by labor unions. It is a complex problem, and to date little has been done on a broad national scale to study the problem and establish bases and data that can serve as the foundation of uniformity.

S.A.M. PERFORMANCE RATING STUDY. In recent years a number of noteworthy studies have been undertaken to determine the consistency with which individuals can be trained to rate performance. The most comprehensive of these was the study conducted by the Society for Advancement of Management Committee on Rating Time Studies.[3]

This study has provided a far better insight into the problems of performance rating. The training films produced in the course of this study have provided: (1) bench marks of proper performance on operations representing a range of manufacturing and clerical work; (2) a concrete basis for judging industry differences in the concept of proper performance; (3) a valid training procedure in time study, and a follow-up measure for consistency; and (4) help in resolving grievances.

Anyone undertaking the establishment of time standards should become familiar with this study and the other similar studies conducted at various universities.[4]

Anyone using the results of these studies should also be aware of the criticisms which have been leveled at them by Gomberg and others. Regardless of any validity of these criticisms, greater consistency of estimation of performance level is obtained when such training methods are used for time study analysts than when they are not.

Properly trained workmen are a material aid since the analyst studying a proficient worker has fewer variables to consider. It is also important that a sufficient number of operators working on the same operation be studied to give the analyst greater confidence in his conclusions. The constant checking by one engineer with another as to their common concepts of work requirements in relation to time standards will help attain uniformity in this respect within the plant and company, and should be a regular practice.

Management's recognition of the caliber requirement of the competent industrial engineer and time study analyst, plus a realization of the

[3] *Manual of Performance Rating Time Values for Twenty-four Operations Shown on Eight Reels of Motion Picture Film*, Society for Advancement of Management, New York, 1950.

[4] M. E. Mundel, *Motion and Time Study, Principles and Practice*, 2nd edition, Prentice-Hall, Englewood Cliffs, N. J., 1955; Ralph M. Barnes, *Work Sampling*, John Wiley and Sons, New York, 1957.

degree of training they require before being considered competent, are important if we are to attain the desired precision in the matter of establishing measured work standards.

In addition to training, two methods are successfully used in order to reduce the possibility of errors through the exercise of individual judgments of performance level. These methods are the use of statistical method and standard data.

STATISTICAL METHOD VERSUS JUDGMENT. Considerable work has has been done in the attempt to establish a statistical method that will remove the need to exercise judgment. Although to date no one has demonstrated a purely statistical method of analysis that will indicate when the proper level of performance has been reached, there is every indication that the use of statistical methods can be a tremendous help to the individual engineer. For example, Sylvester[5] reports some interesting results from the use of the modal method of time study analysis. His thesis seems to be that a remarkable correlation exists between the modal time values obtained from studies made before an incentive is installed with the average values obtained from studies after the incentive is installed. He has, however, found it necessary to temper the actual modal value with some judgment as to whether the conditions surrounding the job and the skill of the operator, together with the distribution of the time values, were such as to allow him to use the actual modal value or whether to use a value adjusted as he says to a cell above or below the modal value.

This is apparently a method that may hold some possibility for the reduction of the range within which the individual will be forced to rely purely on his judgment. This factor is important since most people tend to judge performance level most effectively in the range surrounding their conception of normal performance. Many companies are now using distributions of the statistical data obtained from the individual elemental times to help them in arriving at a decision about the type of study and the type of performance that they are attempting to evaluate.

STANDARD DATA

The next thing which can be done to increase the consistency in performance rating is to increase the number of different people making the judgment and, of course, to increase if possible the number of different operators studied while performing the job. If standards

[5] L. A. Sylvester, *The Handbook of Advanced Time-Motion Study*, Funk & Wagnalls Co., New York, 1950; Adam Abruzzi, *Work Measurement*, Columbia University Press, New York, 1952.

are being established independently for individual jobs, the only way this can be done is to assign more people to study the job. Another, and unquestionably the most satisfactory, way to increase the number of judgments, and thereby cut down the error, is through the development of standard data for the work in question. Since standard data properly developed combines the judgments of many individuals at different times, and usually the performances of different operators, the effects of any individual variations in judgment are reduced and the group consensus for the proper performance level for the operation becomes the standard.

Although considered by many to be a fairly recent development, most qualified time study analysts have always used a form of standard elemental data. In addition to his judgment of the amount of work required to perform the operation, the analyst has compared the elements of work found in the operation with similar or identical elements of work found in other operations whose measured standards have been proved in actual practice. He can use these proved elemental standards to check his judgment or, if he has sufficient elemental standards available, he may develop the work standard from these elemental data and use the time study analysis only as a check on the standard constructed from this proved standard data.

Here we have the desired goal in the time study process—the development of standard data based on elemental time standards proved in actual practice that will permit developing or constructing standards on new operations. Then, using the time study technique only as a check on the elements involved, we can develop such additional data as are required to maintain properly the completeness and accuracy of the standard data tables. The development and use of standard data have gained impetus in recent years. This impetus has been helped substantially by the availability of the predetermined elemental time systems.[6]

Predetermined Time Systems. The predetermined time systems differ from ordinary standard time data development in one important aspect. The ordinary standard data have usually been developed to cover a series of motions grouped into elements that may differ from operation to operation. The predetermined elemental time systems, on the other hand, provide time values for elements that are more or less basic for all kinds of work. This makes the data applicable to most work.

[6] H. B. Maynard, G. J. Stegemerten and J. L. Schwab, *Methods-Time Measurement*, 1st edition, McGraw-Hill Book Co., New York, 1948; G. B. Bailey and R. Presgrave, *Basic Motion and Time Study*, McGraw-Hill Book Co., New York, 1958.

Much has been written[7] and much remains to be discovered about these systems. When the analysts are carefully selected and trained in their use, each system seems to provide satisfactory results. They unquestionably do provide excellent descriptions of motion patterns or work methods. Their intelligent use provides better work methods faster. None of them are as economic to use for setting individual standards as stop watch time study. Their greatest use today and in the future seems to be for the development of gross standard data. No time study analyst should be considered competent today unless he has been trained to use and has used some form of predetermined elemental time systems. Nor should he be considered competent unless he understands the limitations of these systems.[8]

MAJOR USES OF STANDARD DATA. It is difficult to overstress the importance of reliable standard data to a modern enterprise. A list of the uses to which this data might be put would include:[9]

1. Bases of standards used for establishment of wage incentive plan.
2. Basis of standards used for developing standard costs.
3. Basis of standards used in developing operating budgets.
4. Making cost estimates.
5. Data in designing plant layouts, process equipment, products, tools, jigs, fixtures, and methods.
6. Basis for the development of standard data for use in all departments and plants.
7. Preparing production schedules and plans.
8. Manpower planning and employee relations.

To develop data that are used for such a variety of purposes requires that each study be made in detail and with accuracy. It requires that each study be made by a competent trained analyst. That it be done so is vital from both a cost and a labor relations standpoint.

SUMMARY OF REQUIREMENTS FOR ACCURATE WORK STANDARDS. We might summarize the principal points upon which the attaining of uniform accurate standards depend as follows:

[7] Marvin E. Mundel and Irwin P. Lazarus, "Predetermined Time Standards in the Army Ordnance Corps," *The Journal Of Industrial Engineering*, November 1954; H. B. Maynard, *Industrial Engineering Handbook*, Section 4, McGraw-Hill Book Co., New York, 1956, pp. 4–3 to 4–118.

[8] William Gomberg, *A Trade Union Analysis of Time Study*, Prentice-Hall, Englewood Cliffs, N. J., 1955; Adam Abruzzi, *Work, Workers and Work Measurement*, Columbia University Press, New York, 1956.

[9] H. B. Maynard, *Industrial Engineering Handbook*, Section 3, McGraw-Hill Book Co., New York, 1956, pp. 3–227 to 3–238.

1. The proper organization of the job based on the findings of thorough and complete methods studies.
2. The training of the operator in the proper method of work.
3. The competence and ability of the engineer making the study.
4. The degree of consistency attainable under the particular work measurement procedures and techniques used.
5. The proper and constant maintenance of standards in accordance with changes introduced into the operations.
6. The adherence of new standards as they are developed to the established normal output level to the degree possible, using present methods and techniques.

THE PROBLEM OF UNIFORMITY WHERE INACCURATE STANDARDS EXIST. In this struggle to attain uniformity and precision in establishing work standards, we are constantly faced with the problem of reconciling standards established under what we may term modern techniques with those established in the past under some outmoded and abandoned practice, such as past averages or the foreman's estimate.

If there is a wide difference in old and new standards on comparable operations, and there probably is, then a strong labor relations angle enters the picture. It might be that the unions will exert pressure for some loosening of the new standard, at least to approach the old standard if not actually meet it. Yet to yield in this point on some specific operation or group of operations throws the whole basis of uniformity out of balance and sets off a series of repercussions that can completely unbalance the entire concept of accurate standards in that plant.

Therefore, management must hold firm to its basis for and concept of uniform standards against such pressures. Other means of reaching an agreement with the unions on these discrepancies must be found that will not introduce further errors into this search for precision. The nature and degree of the basis for such an agreement will depend largely on the measure of maturity and common objectivity the union and management have attained in their working relations.

A standard once established must not be subjected to bargaining or negotiating. A production goal might be established by bargaining but a standard—never. A standard for work required to perform an operation must be established as carefully and accurately as modern methods permit. It must never be subjected to influence of any sort that will distort it.

BARGAINING TIME STANDARDS. Workers and union representatives alike should be encouraged to present factual information that will aid in developing and maintaining fair and equitable standards. If the

technical procedures and basis for cooperation outlined in the previous chapters is followed, there should be no need for collective bargaining relative to the individual standards of performance. On the other hand, the union may insist that safeguards be incorporated into the union contract.[10]

Any fair-minded management should be willing to discuss the basis for its standards at any time and to adjust to whatever changes are factually established. It should as a matter of record be willing to include the statement of its complete incentive policy as a part of its union contract. It should also be willing to establish a regular grievance procedure to make sure that any complaints are considered by the top level management with the full benefit of any qualified technical assistance available.

Management may insist that it retain the final decision on performance standards. If this is written into the contract, the union is bargaining away a right to negotiate that is implicit in the current interpretation of N.L.R.A.[11] Consequently, in return some unions will insist that they have an "escape" from the "no-strike" provision in their contract in case they are not satisfied with a standard after processing a grievance regarding it up to top management. To avoid the possibility of strikes over each of these grievances a substantial number of companies have agreed to arbitration at this point. If arbitration is selected as an appropriate means of settling such disputes, it is necessary to limit the scope of arbitration in order to keep the determination of standards on a relatively factual basis. First, it should be required that the arbiter be fully qualified technically and thoroughly familiar with modern work measurement techniques and the procedures used by the company. Second, he may be allowed to rule only on the consistency of the standards relative to other standards of performance in use by the company. With limitations such as these, arbitration seems to be a workable solution.

If some solution such as this is not acceptable, then it is obvious that the state of union management relations is so precarious that any agreement is likely to be difficult to reach and administer.

Again, let us emphasize the absolute need for mutual trust and respect by both parties. If these are attained, mutual agreement on a basis for standards can be reached. If they are absent, no amount of legalistic wording of contract clauses will correct the situation.

[10] *Collective Bargaining Provisions*, Bulletin No. 908-3, United States Department of Labor, Bureau of Labor Statistics, U. S. Government Printing Office, Washington 25, D. C., 1948.

[11] William G. Ireson and Eugene L. Grant, *Handbook of Industrial Engineering and Management*, Prentice-Hall, Englewood Cliffs, N. J., 1955, pp. 1179–1183.

PART THREE

Wage Incentive System Design

An incentive plan can be developed for any operation or service in a plant. The limitations faced in developing incentive applications are those of the engineer's ability and ingenuity in developing proper standards and in establishing relatively simple means of obtaining accurate production counts. These limitations are real and will vary in degree between plants and industries. Yet the engineer must be constantly seeking ways and means of overcoming these obstacles in order to obtain maximum incentive coverage.

The previous two sections of the book have been devoted to a discussion of principles and policies that should serve as the bases for wage incentive plans as well as govern their installation and operation. The intent in this section is to review some of the problems and factors involved in tailoring these principles and policies into suitable, successful incentive plans.

In the development of a plan for any given operation there are certain factors or components that should be weighed and considered in determining whether or not they are factors in that particular operation and, if they are, the degree to which they affect the total

cost of the operation. Once this has been done, it then becomes the problem of the engineer to develop ways and means of establishing the proper control over each factor or component in the development of the standards and the plan for that operation. These factors are:

1. Material Utilization and Spoilage

This concerns the amount, value, and kind of material that should be used per unit of product plus the percentage of spoilage that must be considered as normal or expected for that process or operation.

2. Quality

What is the standard acceptable quality established for that operation? What are the difficulties involved in maintaining that standard? What are the cost results if not maintained?

3. Machine Utilization

What is the maximum machine utilization we can expect after establishing the proper methods and standards for making set-ups and loading the machine? This involves determining proper feeds and speeds for each machine and type of use.

4. Man Power Utilization

To what degree are the time and energy of the operator utilized in relation to what would be considered normal utilization? What is the nature of the waiting time involved? Can additional work be assigned to reduce or eliminate the otherwise unavoidable waiting time?

5. Tool and Equipment Usage and Maintenance

What is determined to be the normal tool usage and breakage in the performance of the work involved? What damage can be done to the equipment by overloading and the like?

The engineer must give careful thought and attention to each factor in developing his plan. Although every effort should be made to keep the final plan as simple as possible, its success or failure depends to a large degree on the development of the proper balance among various cost factors involved.

In addition to these factors concerning the individual operation, no wage incentive system design is complete unless consideration has been given to the attainment of maximum coverage. This means the consideration of the extension of incentives to service and supervisory-

type jobs. Guides for the establishment of incentives for these jobs are likewise discussed here.

It is then up to the individuals responsible for and interested in the installation to proceed to weigh these factors and develop a design that will accomplish their objectives, both for the short- and long-term good of their organization.

CHAPTER TEN

The Control of Quality and Waste

When the basis for an incentive installation is being developed, all factors must be fully considered in the final development of the bonus performance standards and controls. In earlier incentive installations it was not uncommon to learn after the plan was in effect that sufficient controls over quality and waste were not included. When this was found to be the case, the result was often that gains in production were offset, or more than offset, by the increased spoilage and excessive material usage. In other words, the standards were developed so that the production element was overemphasized to the detriment of the quality or spoilage and material usage elements.

Therefore it is imperative that the spoilage, quality, and material usage factors be considered fully when making the analyses leading up to the development of the bonus standards and controls. If this is done we are in a position to determine the type and degree of control we wish to place over these factors on as accurate a basis as can be developed. Thus we not only keep all factors in balance and obtain a better incentive plan, but we also avoid future problems and confusion that arise from an inadequate and faulty plan which must be changed or discontinued.

There are many different approaches to this problem of controlling quality and waste. They range from the use of non-financial controls

to the point where these factors are the dominant ones in the incentive plan. The prominent features of some of the more representative types and the conditions under which they are most likely to be used are listed for illustration.

NON-FINANCIAL TYPE OF CONTROL

This type of control is most generally used when the operations are such that quality or waste is not a major problem. It may also be used in unusual cases where, although these factors are important, they are so difficult to measure, from a definite operation and responsibility viewpoint, that no attempt is made to make them a part of the incentive plan. In such cases these factors may play a prominent role in the supervisor's incentive plan. This situation will be discussed in Chapter Thirteen.

The non-financial controls usually consist of posting the quality and usage performance record of each employee or group of employees on a competitive basis in each department; or some other such publicity device may be used. Widespread use of statistical method for quality control has greatly encouraged this form of incentive. The posting of control charts at the work place has had excellent results in many cases,[1] and these records may be used as substantiative data for consideration of promotion, transfer, or layoff. They also usually involve conducting educational and training programs on the value of the materials used and how to conserve them. Their obvious disadvantage is the burden they place upon the supervision to maintain satisfactory performances on these waste factors without the aid of a financial incentive.

PAYMENT OF PRODUCTION INCENTIVE EARNINGS ON "GOOD" PRODUCTION ONLY

This is perhaps the most universally applied of all the various controls placed over these factors. As indicated, it involves including in an employee's production count for incentive purposes only those parts or products that meet the specifications or inspection requirements and are acceptable at subsequent operations or as first-quality products. To include such a stipulation as this appears obvious and

[1] Irving Burr, *Engineering Statistics and Quality Control*, McGraw-Hill Book Co., New York, 1953.

E. L. Grant, *Statistical Quality Control*, McGraw-Hill Book Co., New York, 1946.

yet it has been overlooked upon occasion with most unsatisfactory results. It is often overlooked because it is easier to count the total pieces going through a machine than the good pieces coming from it.

This type of control is usually applied when the labor cost is clearly the dominant factor, with material costs either low or the danger of spoilage relatively low. Pattern or model making would be an example of this type of operation, although there are many other regular production examples, such as where the material is readily reclaimable if it is spoiled with little loss other than the labor expended upon it up to that point.

PAYMENT OF PRODUCTION INCENTIVE EARNINGS ON GOOD PRODUCTION ONLY WITH SALVAGE TIME INCLUDED AS WORK TIME

This type of control is merely a more restrictive offshoot of the preceding one. The additional provision is usually administered by adding the total salvage time to the total production time taken by the operator in producing the parts in question. In this way full credit is allowed for all production after it has been salvaged and passed by the inspection section. This control has a number of readily recognizable applications. They include machining, assembly, sorting and inspecting, cleaning, and like types of operations.

PAYMENT OF INCENTIVE FOR REDUCTION OF WASTE OR CONSERVATION OF MATERIALS

This type of control is of greatest value in operations where the relative value of the material is high and the operator by his skill and attentiveness can keep both material usage and spoilage at a minimum. It might also be used where an operation definitely requires extra vigilance to prevent undue waste. In such instances it is highly desirable to place a direct financial incentive control over material usage and quality by making it a distinct contributing factor in the total incentive plan. This type of control finds its most common applications in those operations involving the fabricating of materials of comparatively high value.

It can be developed in the following manner:

1. Establishment of Limits of Performance Expectancy

On the basis of the careful statistical analyses made of those factors that constitute material waste, limits of performance are established

that will serve as the basis for the payment of bonus when they are met.

Two limits are first chosen, the average point and the incentive point. The average point is that one which should be met if the operator is qualified to perform the work and exercises average diligence. Therefore, it is the break-even or 0 per cent bonus point. It is not necessarily the actual average based on past performance, but may be, and probably is, a calculated figure.

The incentive point is established at that level of waste performance which can be met or even exceeded by a qualified workman if he applies himself to a degree that can be considered the incentive performance. This level is well within the realms of practicability, but it does require that extra diligence which the qualified worker is capable of applying in order to attain it. Accordingly, he would be paid a bonus for exercising above-average diligence.

2. Relation Between Waste Bonus Factor and Production Bonus Factor

Although both factors stand on their own feet insofar as their earnings determination is concerned, they do affect each other in the final calculation of an employee's bonus earnings. Earnings or losses on the waste factor are added to or subtracted from the earnings or losses on the production factor so that a net bonus is paid.

On a straight production bonus a worker can earn 25 per cent bonus by attaining the output level designated as incentive. Under this type of dual plan he can attain only a portion of the 25 per cent bonus. The portion to be earned from production at the incentive level would be represented by the weight given to the production factor. For example, if the analyses show that the incentive should be split equally between waste control and production, we should find each paying 12.5 per cent bonus at their incentive performance levels. Thus, instead of the usual 25 per cent spread between average performance and incentive performance, as in the case of single-control incentives, we here have a spread of 12.5 per cent. However, the two factors total 25 per cent at their respective incentive levels.

3. Determination of Relative Weight Given Waste for Bonus Purposes

This is indeed a problem and it can be quite a controversial one. However, there is no more accurate means of determining mathematically the per cent bonus weight that should be given waste than to use our best judgment after careful study of such cost statistics as the following:

A. Ratio of material cost to labor cost.

B. Waste savings that can be accomplished by improving current

performance so that it exceeds the past average waste percentage and equals the performance that has been designated as the break-even or 0 per cent bonus point (bonus average, performance point), as compared with potential production savings.

C. Perhaps the most satisfactory basis is the ratio of waste savings between its designated bonus average and incentive points and the production savings between its designated bonus average and incentive points, excluding in both calculations the money that would be paid out as bonus.

An example of how this ratio would be determined is given below, using the same data as appear under item 5 following.

$$\text{Ratio of material cost to labor cost} = \frac{200{,}000}{4992} = 40.06$$

Waste savings to break even = \$4600.00
Production savings to break even = \$2496.00
Production savings from average to incentive (excluding bonus)

$$= \left(\$0.60 - \frac{0.60}{1.25}\right) \times 8320 \text{ hours}$$

$$= \$998.40$$

Waste savings from average to incentive (excluding bonus) = \$1000.00

Weight to waste 50% Weight to production 50%

4. Effect of Production Volume on Waste Bonus Paid

There is one condition in this dual factor bonus basis that is often overlooked from a waste bonus viewpoint and that is the effect of production volume on waste bonus earned. Obviously it should require less diligence to earn the normal waste bonus at average production output than at incentive production output, which is 25 per cent higher. There is less chance for something to go wrong. A worker, moreover, may choose this relatively easier method of earning a satisfactory bonus of as much as 12.5 per cent on the half-and-half weight factor basis we have assumed rather than strive for a higher total bonus by increasing his production above break even.

Yet, in doing so he does not perform to the same degree as does the operator who is endeavoring to achieve incentive performance on the production factor as well as the waste factor. Nor is he contributing the savings from a waste standpoint at his average or break-even production performance, as is the individual producing at incentive or 12.5 per cent bonus earnings performance. Consequently he is not entitled to the same return on his waste performance.

To illustrate further, let us assume that 100 pieces an hour is break-even and 125 pieces is incentive performance from a production standpoint. At break even, then, the worker earns 0 per cent bonus and at incentive 12.5 per cent. Assume that 1.20 per cent waste is the expected attainment for which 12.5 per cent bonus would be paid. Therefore, at the average production of 100 pieces he can earn 12.5 per cent waste bonus if he produces 98.8 good pieces. Yet the second worker, producing at incentive or 125 pieces per hour, gets paid the same 12.5 per cent bonus for 123.5 good pieces. The higher cost that would prevail in the first instance is readily apparent, and it is against this contingency that corrective measures should be taken to encourage the worker to strive also for incentive productivity or better.

Then, in order to compensate to a degree for waste performance at various levels of production, a volume factor should be developed that directly relates the amount of waste bonus paid to the amount of production bonus paid. This is accomplished by developing the ratio of standard hours to actual hours at average production.

Let us remember our original premise, that for incentive waste performance and incentive production 25 per cent bonus is paid. Let us also remember that we are maintaining our same relation between average and incentive (1.00 average, 1.25 incentive). Therefore our volume factor is determined by dividing the ratio between standard hours earned and actual hours expended by the incentive bonus factor 1.25. For example, at average performance one standard hour is earned and one actual hour expended, giving us a ratio of 1.00. Then, to determine our volume factor with which to compensate our waste bonus earnings at average production performance, we divide 1.00 by 1.25, which gives us a volume factor of 0.80.

To illustrate further how this factor is used, let us assume a hypothetical case again in which 50 per cent weight is given to waste and 50 per cent weight is given to production.

Weight given waste	50%
Waste bonus at incentive production and incentive waste	12.5%
Waste bonus at average production and incentive waste	10.0%
Weight given production	50%
Production bonus at incentive production	12.5%
Production bonus at average production	0%

Waste bonus at average production equals waste bonus at incentive production, modified by the volume factor explained above which was determined as follows:

Standard hours to actual hours ratio at average production = 1.00

$$1.00 \div 1.25 = .80 \text{ volume factor}$$

Waste bonus at incentive production and incentive waste = 12.5%
Waste bonus at average production and incentive waste = $.80 \times 12.5\% = 10.0\%$

Using the same hypothetical case, let us assume further that:

1.70% waste = Established average
1.20% waste = Established incentive

A waste bonus would then be determined according to the following scale showing its volume factor variances:

	Ratio Production Standard Hours to Actual Hours								
	0.90	0.95	1.00	1.05	1.10	1.15	1.20	1.25	1.30
WASTE, %	Volume Factor								
	0.72	0.76	0.80	0.84	0.88	0.92	0.96	1.00	1.04
	Production Bonus								
	−5.0	−2.5	0.0	2.5	5.0	7.5	10.0	12.5	15.0
	Waste Bonus								
1.10	10.8	11.4	12.0	12.6	13.2	13.8	14.4	15.0	15.6
1.15		10.5	11.0	11.5	12.1	12.6	13.2	13.8	14.3
Incentive									
1.20			10.0	10.5	11.0	11.5	12.0	12.5	13.0
1.25			9.0	9.5	9.9	10.4	10.8	11.3	11.7
1.30	7.2	7.6	8.0	8.4	8.8	9.2	9.6	10.0	10.4
1.35	6.3	6.7	7.0	7.4	7.7	8.0	8.4	8.8	9.2
1.40	5.4	5.7	6.0	6.3	6.6	6.9	7.2	7.5	7.8
1.45	4.5	4.8	5.0	5.2	5.5	5.7	6.0	6.3	6.5
1.50	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.0	5.2
1.55	2.7	2.8	3.0	3.1	3.3	3.4	3.6	3.8	3.9
1.60	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6
1.65	0.9	0.9	1.0	1.1	1.1	1.2	1.2	1.3	1.3
Average									
1.70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.75	−0.9	−0.9	−1.0	−1.1	−1.1	−1.2	−1.2	−1.3	−1.3
1.80	−1.8	−1.9	−2.0	−2.2	−2.2	−2.3	−2.4	−2.5	−2.6
1.85	−2.7	−2.8	−3.0	−3.3	−3.3	−3.4	−3.6	−3.8	−3.9
1.90	−3.6	−3.8	−4.0	−4.4	−4.4	−4.6	−4.8	−5.0	−5.2

Daily calculation of total bonus can be simplified by combining production and waste bonus in the table by simple addition.

5. Example of Condition Under Which This Type of Waste Incentive Would Be Applied

We should keep in mind that this incentive is designed primarily for operations showing high waste of a highly variable nature and requiring close attention on the part of the operator to control. Also, savings resulting from this waste control will warrant paying a substantial bonus for that control.

An example of this condition is:

Material		Labor	
Material cost per year	$200,000.00	Labor cost per year	$4992.00
Value of 1% of material	2000.00	Preinstallation cost per standard hour	0.90
Value of 1% of waste	2000.00	Break-even cost per standard hour	0.60
Preinstallation % waste	4.00	Savings per standard hour @ B-E*	0.30
Established standard average waste %	1.70	Labor hours per year	8320
Established incentive waste %	1.20	Savings per year @ B-E*	$2496.00

Saving per year preinstallation to average = (4.00–1.70) × $2000
= $4600.00

Gross savings per year average to normal = (1.70–1.20) × $2000
= $1000.00

Weight to waste	50%	Weight to production	50%
Waste bonus at incentive waste and production	12.5%	Incentive production bonus	12.5%

Waste bonus at normal waste and production = 12.5% × $4992
= $624.00

Net waste savings per year average to incentive = $1000 — $624
= $376

Total material savings per year = $4600 + $376
= $4976 (potential)

* B-E = break-even or 0 per cent bonus point.

6. Essentials to the Successful Application of This Plan

A. That waste savings above break-even bonus performance (average) at least equal waste bonus paid above break even.

B. That poor waste performance act as a penalty against production bonus earned.

C. That poor production performance act as a penalty against waste bonus earned.

D. That waste causes be readily determinable and definite responsibility be able to be fixed for them within reasonable limits.

PAYMENT OF INCENTIVE ON GOOD PRODUCTION ONLY WITH THE FAILURE TO MEET ESTABLISHED WASTE STANDARDS ACTING AS A PENALTY

This type of control would be used when the desire is to maintain satisfactory quality and waste performance as production increases under a direct production incentive. In this case the major emphasis is placed on output, but at the same time the value of the material is sufficiently high that a strong check must be placed on any carelessness that might adversely affect both quality and usage. Another instance of its use is in the manufacture of a bulk or quantity product, where it is essential that a certain average quality specification be maintained.

The production standards and production bonus calculations remain the same for this type of control as are used by a single-control incentive when the sole emphasis is on production. However, in order to receive the full production bonus earned, definite spoilage or quality standards must be met. If they are not met, the production bonus is penalized accordingly. This penalty waste control requires the establishment of an average per cent waste, and an incentive per cent waste, as discussed under the type of control immediately preceding this particular discussion. The determination of the relative weight to be given waste and production would also be made in the same manner as discussed under the same previous control.

Ordinarily this control does not compensate for any material savings that might be gained through meeting the established standards when they are more exacting than past performance. Its maximum penalty is usually the cancellation of all production bonus for that day. Should there be any penalty still remaining after that has been done it is canceled. It is of further note that in this type of control, consideration is seldom given to a volume factor such as we discussed previously. The reason for this is that production, not waste, is emphasized.

Again, if 1.70 per cent is used as average and 1.20 per cent as incentive waste performance, the bonus chart for this type of control would appear as shown in the table on page 114.

To summarize, this type of control would be used where material cost ratios may be high, but the waste performance is near incentive so that little would be gained by the application of a direct waste incentive as previously discussed. At the same time, the situation is such that large losses might result if waste increased materially along

Waste Bonus Control Chart—Penalty Factor

Waste, %	Production Bonus Penalty, %	Ratio Production Standard Hours to Actual Hours								
		0.90	0.95	1.00	1.05	1.10	1.15	1.20	1.25	1.30
		Production Bonus, %								
		—10.0	—5.0	0.0	5.0	10.0	15.0	20.0	25.0	30.0
		Net Bonus, %								
1.00	0.0	—10.0	—5.0	0.0	5.0	10.0	15.0	20.0	25.0	30.0
1.04	0.0	—10.0	—5.0	0.0	5.0	10.0	15.0	20.0	25.0	30.0
1.08	0.0	—10.0	—5.0	0.0	5.0	10.0	15.0	20.0	25.0	30.0
1.12	0.0	—10.0	—5.0	0.0	5.0	10.0	15.0	20.0	25.0	30.0
1.16	0.0	—10.0	—5.0	0.0	5.0	10.0	15.0	20.0	25.0	30.0
Incentive										
1.20	0.0	—10.0	—5.0	0.0	5.0	10.0	15.0	20.0	25.0	30.0
1.24	—1.0	—10.0	—5.0	0.0	4.0	9.0	14.0	19.0	24.0	29.0
1.28	—2.0	—10.0	—5.0	0.0	3.0	8.0	13.0	18.0	23.0	28.0
1.32	—3.0	—10.0	—5.0	0.0	2.0	7.0	12.0	17.0	22.0	27.0
1.36	—4.0	—10.0	—5.0	0.0	1.0	6.0	11.0	16.0	21.0	26.0
1.40	—5.0	—10.0	—5.0	0.0	0.0	5.0	10.0	15.0	20.0	25.0
1.44	—6.0	—10.0	—5.0	0.0	0.0	4.0	9.0	14.0	19.0	24.0
1.48	—7.0	—10.0	—5.0	0.0	0.0	3.0	8.0	13.0	18.0	23.0
1.52	—8.0	—10.0	—5.0	0.0	0.0	2.0	7.0	12.0	17.0	22.0
1.56	—9.0	—10.0	—5.0	0.0	0.0	1.0	6.0	11.0	16.0	21.0
1.60	—10.0	—10.0	—5.0	0.0	0.0	0.0	5.0	10.0	15.0	20.0
1.64	—11.0	—10.0	—5.0	0.0	0.0	0.0	4.0	9.0	14.0	19.0
1.68	—12.0	—10.0	—5.0	0.0	0.0	0.0	3.0	8.0	13.0	18.0
Average										
1.70	—12.5	—10.0	—5.0	0.0	0.0	0.0	2.5	7.5	12.5	17.5
1.72	—13.0	—10.0	—5.0	0.0	0.0	0.0	2.0	7.0	12.0	17.0
1.76	—14.0	—10.0	—5.0	0.0	0.0	0.0	1.0	6.0	11.0	16.0
1.80	—15.0	—10.0	—5.0	0.0	0.0	0.0	0.0	5.0	10.0	15.0
1.84	Cancel	—10.0	—5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.88	all	—10.0	—5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.92	bonus	—10.0	—5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.96		—10.0	—5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2.00		—10.0	—5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Waste penalty is not applied when production bonus is 0.0 per cent or lower.
Waste performance below a certain percentage cancels all bonus.
Waste penalty does not penalize production bonus to below 0 per cent net bonus.

with production. An example of a condition under which this type of incentive might be applied is:

Material		Labor	
Material cost per year	$200,000.00	Labor cost per year	$4992.00
Value of 1% material	2000.00	Preinstallation cost per standard hour	0.90
Value of 1% waste	2000.00	Break-even cost per standard hour	0.60
Preinstallation % waste	1.30	Savings per standard hour @ B-E*	0.30
Established average % waste	1.70	Labor hours per year	8320
Established incentive % waste	1.20	Savings per year @ B-E*	$2496.00

Savings per year—preinstallation to incentive = $(1.30 - 1.20) \times \$2000$
= $200.00 or 8.01% of production saving

* B-E = Break-even or 0 per cent bonus.

CONCLUSION

One of the more common objections raised, usually by the supervision, against developing an incentive plan for a department is that it might hurt the quality of the product. It is a legitimate objection because that can be the result if the quality and material usage factors are not carefully analyzed and fully considered in developing the basis for the proposed incentive plan. In the past this consideration was not always given, with adverse results. Yet competent engineers know that adequate protection can be given both quality and material usage in the development of a wage incentive plan. This brief discussion of the problem has emphasized the importance of these factors in an incentive plan and has also indicated possible solutions that will provide the basis for satisfactory answers to a particular problem.

CHAPTER ELEVEN

Utilizing Men and Machines

For purposes of this discussion we can consider that all work falls into one of two natural categories. The first is manual work, including working with hand tools or hand-controlled tools; the second is machine-controlled or machine-paced work.

The opinions of engineers vary as to which is the more difficult type to develop incentives for. It is usually more difficult to determine how much time is required to perform a man-paced job, but the engineer, when studying such operations, is not ordinarily faced with the problem of proper total utilization of a man's time, a problem in most machine-paced operations.

An exception to this statement is gang work. There the problem is one of organizing the work so as to achieve the best balance possible among the various members of the gang or group with a minimum of waiting time for each and all members.

MACHINE-PACED PRODUCTION OPERATIONS

As indicated above, the major problem in machine-paced operations is maximum utilization of both machine and man power. In studying

such an operation the engineer is confronted with the fundamental problems of:

1. Establishing the proper feeds and speeds at which the machines should operate on all the classes of work placed upon them.
2. Developing standard set-up and tear-down methods with proper time standards governing them, these to be a part of the incentive installation to encourage a minimum time being consumed on such non-productive work.
3. Establishing proper methods and standards for loading and unloading parts or material on and from the machine.
4. Determining the true need for the operator's close attention during the time the machine is working.

On the bases of these determinations the engineer can establish standards which will ensure maximum machine utilization insofar as it is deemed obtainable at that time. He should also have determined the amount of free waiting time the operator has available. Free waiting time is that time the operator could devote to other work within the immediate vicinity of his machine without running too great a risk of harming either the machine or the quality of the work in question.

If no effort is made to utilize this free waiting time so that it is kept at a minimum, obviously inequities will arise between jobs having free waiting time and those not having it. This situation may lead to discontent on the part of employees not so fortunate as to have this waiting time as an integral part of their job. It is not unusual in machine-paced operations for the operator to find that he spends most of his time waiting for the machine to complete its work. Of course, he may be required to break up this idle time at regular intervals gauging or otherwise testing the materials being processed. However, he does have idle time that can be utilized in performing other work. Ways must be found to make use of this time in order to eliminate inequities between jobs and to eliminate the waste of skilled labor.

An example of the difficulties inherent in this situation may be illustrated as follows:

> Assume that: Joe works on a machine operation which is 100 per cent man paced. Bill works on a similar machine but on a job requiring only 40 per cent manual work. Bill is idle while his machine is running, that is 60 per cent of the time.
>
> If we pay Bill less than Joe, then Bill is likely to complain that his earnings are limited through "no fault of his own." Therefore, he may say that he is entitled to receive as much pay as Joe.

If we allow Bill as much incentive earnings as Joe, then Joe may have the legitimate complaint that he is actually working more than twice as much as is Bill for the same pay.

If we then buy an added machine for Bill to run, he may argue with reason that he is now doing twice as much work as before and should now be paid twice as much.

MAXIMUM UTILIZATION OF MAN POWER IN MACHINE-PACED OPERATIONS

This can be accomplished in a number of ways, among the more common of which are:

1. Plan and Prepare Machine Layouts So That an Employee Can Operate More Than One Machine

By carefully grouping machines into batteries of two or more units, the operator is often able to run them all successfully with a minimum of machine down time. Obviously, such an arrangement must be worked out with great care so that the machines are grouped in a manner that not only requires a minimum of movement on the part of the operator but also permits ease in handling work in and out of the machines.

The type of work that goes over the machines, the length of their operating cycles, and the degree of close attention they require are all important factors in determining the final layout. Although the machines in the group may be the same type, it is not a requirement. The important and controlling point is the degree of machine and man utilization that can be achieved without harming the quality of the work or increasing spoilage and material waste.

2. Provide Inspection and Gauging Work

Another common device in obtaining proper man power utilization is to provide suitable tools and workplace that will permit the operator to inspect, fit, or gauge parts either completed or in process. The amount of such work he can do will depend upon the requirements of his primary job at any given time. Standards should be developed for this secondary work and the output included in the operator's regular incentive calculations.

3. Hand Forming or Assembling

Again, by providing proper tools and workplace the operator may engage in performing hand-forming operations or making small assemblies. The work should be so organized that it will not take him away

from his primary operation to a degree which might harm the work being performed or the machine itself. Standards should be developed for this secondary work so that it can be included in the operator's total incentive calculations.

4. Repair and Salvage Work

Another relatively common method of solving this problem is to provide the operator with additional work of a repair or salvage nature. This type of work may not lend itself as readily to the application of standards for incentive purposes as work of a straight production nature. Nevertheless, satisfactory standards can usually be developed, and this type of work then becomes a satisfactory secondary operation.

It is well to repeat that one of the most difficult determinations to make under such a situation is the amount of close direct attention the machine requires while it is performing its function. The answer in many cases depends on how modern the particular equipment is in design and controls. As machine design has improved, the degree of the operator's attention required often has decreased because of the protective and safety devices built into the machine that reduce the amount of close observance required. The supervision of the department, as well as the operators, can be of real aid in determining just what these requirements are.

Strict adherence to this procedure forces management to do the best possible planning with resultant lower costs as an added reward. In addition, this completely satisfies two of the basic requirements of sound incentive plans. These policies are:

1. The plan should reward the employee in direct proportion to the increased productivity.
2. The plan should be understandable, and the employees should be able to calculate their earnings easily.

All other means of handling such man-idle time compromise with one or the other of these basic policies.

OTHER MEANS OF HANDLING MAN–MACHINE CYCLES

1. Set a Minimum Limit of Man Productivity for Which Incentive Will Be Established

This is not completely in accord with the basic principle of incentive for individual differences in productivity. It does, however, recognize the practical desirability of establishing incentives for the operating

control of a process. It also gives full recognition to requirement for an adequate incentive increment.

2. Allow Incentive Earnings Only on Man-Controlled Part of Cycle, That Is, Productivity of the Man

If standard incentive earnings were 25 per cent for a 100 per cent manual job, the incentive earnings on a 60 per cent manual job would be based on that 60 per cent of the working time, which would be 15 per cent. This is a compromise based on the idea that the man is entitled to incentive earnings only on his working time and only day work earnings on his idle time. This idea is largely compatible with the basic incentive concept, but where the manual time is relatively small compared to the machine time it may not give an adequate incentive increment.

3. Pay Full Incentive Allowance for Both Man and Machine Parts of Cycle

Some managements feel that the worker should not be penalized since the cycle is "not his fault." This philosophy has lead to destruction of basic incentive concept and ultimately to failure of incentive plans.

If man is actually idle for part of the cycle, his inactivity is completely incompatible with basic incentive idea of reward for individual productivity. There is, however, a matter of degree in regard to idle time.

Some criteria to consider are: Is the cycle sufficiently long to allow relaxation? Could the operator perform additional duties without loss to the effectiveness of the process? If both of these are answered affirmatively, then the use of this payment method is questionable.

4. Pay an Intermediate Incentive Allowance for Machine-Controlled Part of Cycle

Many times the machine allowance is taken at half the manual allowance, such as 30 per cent for manual time and 15 per cent for machine. This "splitting" the difference represents a partial compromise with the basic concept of reward in direct proportion to the individual's productivity in order to satisfy the need for an adequate incentive increment.

5. Safeguard to Apply When Making Concessions to Allow Incentive Increment for Man-Idle Time

It is necessary to have the fundamental understanding (contractual if necessary) that man-idle time is always at the disposal of the company and may be utilized for additional work.

This concept might be stated as follows:

Where possible, standards shall be established on the basis of man capacity. That is, at 100 per cent incentive performance at which 25 per cent bonus is paid, the employee is expected to work at a normal incentive pace. In some cases, however, machine capacity is so limited as to require less than a normal incentive pace of the operator in maintaining the full output of the machine. In such cases an effort will be made to provide additional work for the machine operator or operators, up to the point where their time is completely occupied. If this is impossible to accomplish, the incentive rate will then be established on the basis of machine capacity; that is, at 100 per cent machine performance the operator will earn 25 per cent bonus. In such cases the difference between machine capacity and man capacity will be expressed in a separate allowance, which will be increased or decreased when subsequent changes are made which affect machine capacity or the work done by the operator.

MANUAL PRODUCTION OPERATIONS

For manual or hand operations the chief problem is proper organization of the work and the establishment of equitable standards and controls. Of the five incentive factors mentioned in the introduction to this section of the book, four are important in manual operations. Machine utilization is the one that usually is not of major importance. Tool and equipment usage and maintenance can be important where hand tools of some value are used or where hand-controlled or hand-operated equipment is involved.

The chief consideration then is to achieve the proper balance between production output, quality, material usage, and spoilage in developing the standards. The importance and problems of proper organization of work, work measurement, control over quality, and material usage have been discussed in preceding chapters and need not be repeated here.

CHAPTER TWELVE

Incentives for Service Operations

By service operations are meant transportation, cleaning, job setting, maintenance, and the like. In the past, these operations have been often overlooked from an incentive viewpoint because the controls and methods required to obtain output measurements on them are not so apparent or easily developed as in direct operations. Yet it is important that every effort be made to include them in the plant incentive installation, not only to reduce cost but also to keep the number of non-incentive jobs at a minimum. By doing so the inequities in earnings between incentive and non-incentive workers are reduced.

These inequities in earnings not only are a source of grievance on the part of the non-incentive employees but they also tend to make the jobs in question less desirable. Therefore they are harder to fill, and it is always more difficult to keep people on them. In the past, in order to overcome these inequities, it was not an uncommon practice to place such workers on incentive merely by the device of giving them the average incentive earnings of the group they served. Many times this was done arbitrarily, with no positive control established over the quality or quantity of the work they performed or over the total activity of the group they served. Under such circumstances this procedure was *decidedly bad practice.*

Yet, as mechanization of industry becomes more and more advanced, the ratio of such indirect labor to direct labor is constantly increasing.

Therefore, it is of growing importance that ways be found to place such operations on incentive. Whenever possible, such incentives should be of a direct nature, that is, should have a basis in the productivity of the function in question, rather than some basis involving the performance of other functions they may affect to some degree.

When an intensive effort is made to find some productive unit of measurement that is obtainable in an economical manner, the ease with which this can be worked out is often surprising. It is largely a matter of ingenuity in taking advantage of controls and production counts already required and established by production operations, along with area and distance measurements.

TYPES OF SERVICE OPERATIONS AND PROBLEMS INVOLVED IN PLACING THEM ON INCENTIVE

For the purpose of illustration we shall discuss several representative problems involving service or indirect labor.

1. Material Handling or Transportation

The basic factors involved in material handling or transportation are:

A. Type and nature of material.
B. Weight and bulk of material.
C. Method and means of transportation.
D. Distance traveled.
E. Conditions surrounding and controlling loading and unloading operations.

It is these factors that determine and control the type of incentive plan that can be developed for material handling operations as well as the methods of work and the standards governing them. Owing to the variable nature of the work involved, the standards governing these operations are usually developed in tabular form by like elements. For example, there are three distinct general basic elements involved in these operations. They are load, travel, and unload. Each one of these basic elements is a variable within itself, and all the possibilities must be covered in developing the standards for it.

The trucker may be called upon to load and unload a variety of materials or parts. Each must be covered by a standard. Each may have its standard developed by time allowed per unit or units of material loaded or unloaded. Distance traveled is an obvious variable with feet or some other linear measurement as the unit upon which the standard is developed. However, there are other variables in

that the type of floor or roadway and interferences encountered en route affect the time required. For example, it would be one thing for an overhead craneman to transport a magnet load of castings three hundred feet on a straight run with no obstruction or unusual safety factors in the way, and quite another if he had to thread his way carefully down the floor, moving his load back and forth in such manner as not to endanger any men working under the path of his crane.

Other examples come readily to mind, such as the use of elevators, opening and closing doors, making safety stops, and the like. The important point is that each possibility must be covered by standards, and ways developed to make the proper allowances for all work done and all variables encountered. This will permit the clerk responsible for calculating the incentive results at the end of a day to reconstruct the work done by referring to relatively simple records, and by using time data tables to make the proper time allowances.

Transportation is usually of two general types, which are handled differently insofar as controls and production counts are concerned. The following is a brief discussion of each one.

A. The Servicing of a Definite Group of Machines or Operations. This involves the determination of logical groups to be served and the number of truckers, cranemen, or other service help required to supply them properly at their normal output. In this manner the first control is applied in that the proper service help is specified.

Standards have already been developed covering the various types of materials and parts involved. The problem now is to obtain proper production counts. Many times these can be obtained by using the production records of the direct workers serviced. For example, if a direct worker produces one thousand parts, obviously someone had to bring the material to him and take the parts away. If the source of the materials can be located readily—and within definite known areas—as well as the points of disposal, the problem of reconstructing the work done is not too difficult. Often it is necessary to provide the trucker with a properly designed form upon which he can record points of disposal and the like. This record can also serve as a means for noting unusual or non-repetitive operations which he is required to do and for which allowances are made as they occur.

When the problem of placing such service workers on direct standards is too complex from a recording standpoint, they can be considered a member of the group they service. However, as indicated earlier, they must not be attached to a group without any control placed over them. In such instances the number of operators a man can service must be carefully determined and established as standard. Then he

can participate on the basis of the average earnings of the operators he services on the theory that he can aid their production results by providing them with prompt, efficient service.

In the event that the number of operators serviced drops below the standard number, the service man's participation should be affected in direct proportion to the activity of his group. For example, if the normal number of operators serviced is four and only three are involved, the service man might participate on the basis of 75 per cent of his full participation basis.

B. Transportation of a General Nature. This type would involve the general plant transportion unit. Ordinarily, such work is scheduled by a chief dispatcher, and it is his order sheets, plus the record kept by the trucker, that serve as the basis for determining the work done. Then, by the use of time data tables and distance charts the clerk can reconstruct the work done and make the proper allowances.

Obviously there are more variables under such a set-up as this than in a restricted area with a comparatively limited group of materials or parts. However, these variables can be covered and such operations placed on incentive successfully. The degree of accuracy obtainable may leave something to be desired, but if sufficient time and thought are devoted to the problem it can be solved in an acceptable manner.

2. Cleaning and Janitor Work

Such work as sweeping, scrubbing, and window washing have a common unit of measure in area cleaned. In addition to area, there are other variables such as nature and condition of the surface to be cleaned, kind of equipment used, materials used, and the accessibility of the surface, together with obstructions to be overcome.

Time data tables, similar to those discussed under transportation, can be developed to cover these variables in a manner that will keep the incentive accounting procedures sufficiently simple. Work accomplished can be recorded by the supervisor of the group as he assigns the various tasks and inspects the quality of the completed work.

The opportunities for cost reduction through specifying proper tools and equipment as well as methods of work should not be overlooked. Operations such as these lend themselves to such studies just as readily as do straight production operations, with just as satisfactory results.

INSPECTION

There are strong differences of opinion as to whether or not inspection operations should be placed on incentive. However, as additional

experience is gained with inspection incentives the trend is toward placing such operations on incentive. The obvious basis for these objections is that an incentive might encourage the inspectors to slight their work in order to increase their earnings and thus harm the quality of the product. It is true that an improperly developed incentive plan might do that very thing. Yet it is desirable to extend an incentive plan to include inspectors if a satisfactory basis can be worked out. A successful plan tends to eliminate inequities in earnings between incentive and non-incentive workers and at the same time establishes proper controls over an important group of operations.

The Problem of Developing Inspection Incentives

Since the primary function of an inspection operation is to detect and remove defective or inferior parts, products, or materials, it is essential that this point be emphasized in the development of the incentive plan. At the same time, it is important that quality of output not be overlooked, as inspection costs must be kept in line the same as all other costs. The goal to be sought is a balance between quantity of output and quality of inspection that lends the proper emphasis to both. For purposes of discussion let us separate the inspection function into two groups—work in process inspection and final inspection.

1. Work In Process Inspection

This type of inspection is placed at specific points in the manufacturing process to check quality and specification of the work performed up to that point. The purpose of this inspection is to prevent additional work being done on a product that is not up to specification. In this type of inspection incentive, greater emphasis can be placed on productivity than otherwise since other inspections will follow. Thus the possibility of placing such operations on a production incentive, with severe penalties for defective or substandard work found at subsequent operations that should have been caught at this point, should be investigated.

Excessive earnings under these conditions are an immediate danger signal that calls for an investigation to determine if the work is being slighted. Although it must be recognized that there will be exceptional inspectors, just as there are exceptional workers in any line, a positive and immediate check must be made of any performance that appears unusual. This check is only to insure proper performance and should not be construed as a device either to limit earnings or to lead the inspectors themselves to place a ceiling on their earnings.

It must be recognized further that the general quality of the work being inspected will influence heavily the production performance of the inspectors. Should there be wide swings in the general quality of the work being inspected, then it may be necessary to establish different standards to govern the different distinguishable general quality grades encountered. Furthermore, if found advisable, a system of check inspection could be set up for this type of operation on the same general bases as we shall discuss in the next section.

2. Final Inspection

The problems of establishing incentives for final inspection operations differ from those of work in process inspections in that the former workmen are the last link between the production organization and the customer. Therefore, the quality factor looms very important in their total incentive picture. Usually there are three major factors considered in establishing an incentive for final inspection operations. They are productivity, percentage of good product found set aside as bad, and percentage of bad product passed as good. The weight given each depends entirely upon the nature and value of the product, its end use, and the tolerances permissible.

The problem of developing proper standards for productivity follows the same pattern as discussed under "Work in Process Inspection." The problem of maintaining quality of inspection usually involves the use of check or sample inspection. This includes establishing sample lot sizes determined by statistical methods and proved by actual test. When used as the basis for the check inspection these sample lot sizes provide an accurate picture of the quality of the work performed. Thus, all work performed by the final inspector is submitted to a check inspection before it is released. For example, it might be found that a 33⅓ per cent check inspection of the product set aside as defective gives an accurate picture of the soundness of the inspector's judgment in that respect. It may further be found that a 5 per cent check inspection of all product passed as good provides an accurate picture of the inspector's judgment in that respect.

By establishing the proper balance between these factors of productivity and accuracy, and by developing control scales showing both gains and penalties under each, a sound incentive plan can be developed.

MAINTENANCE WORK

This is another field of endeavor that has proved quite controversial as to the practicability and economics of developing incentives for it

of a direct nature. Yet, those who have set about in a determined manner to develop direct incentive plans for their maintenance workers have found that it can be done successfully and with excellent results, both from cost reduction and increased earnings standpoints.

Two Types of Maintenance Work from an Incentive Standpoint

Maintenance work generally falls into two classifications: routine inspection and preventive maintenance and repair work.

1. Routine Inspection Plus Preventive Maintenance

In most plants there are certain members of the maintenance crew permanently assigned the duties of making regular rounds to look after various types of equipment. This work may include oiling motors and equipment and inspecting electrical connections and wiring, motors, beltings and chains, and a host of other like duties. It may also involve making minor repairs or temporary emergency repairs when necessary. It is customary to provide each worker with check sheets governing the work tour he is required to make. On these sheets he either checks the proper information or makes a record of the condition of the equipment in question, also noting any repair work done on such equipment during that tour.

Thus the pattern or basis for the incentive plan and its direct standards becomes apparent. The standards must be built in a tabular form that will permit the bonus clerk to reconstruct the work done and apply the proper standards. Obviously considerable confidence must be placed in the integrity of the worker under such a plan, but it has been found that this confidence is seldom misplaced. Furthermore, supervision can check on the quality of the work done. In addition to this check, the performance and repair records of the equipment provide the data for the final test of the quality and effectiveness of the inspection and preventive maintenance work performed. It is also possible to develop penalty factors on such bases as these, but it is not usually necessary or desirable to do so.

2. Repair Operations

This type of maintenance work usually involves the overhauling and repairing of machinery, motors, and equipment, as well as building maintenance and repair. The degree of the repair may vary but it usually follows a set pattern of tearing down the equipment, overhauling it, and reassembling it. In building maintenance it is usually a matter of replacement, repair, or painting. This work may be done

either in the maintenance shops or at the location of the equipment or building. In either case, direct standards can be established accurately and adequately if sufficient time, thought, and energy are applied to the task.

The important point again is to construct the time data and standards in such a manner that they permit not only the proper recording of the work actually done but also the application of the proper standards. There are certain to be many variables that must be considered, but they can be solved and controlled with most satisfactory results. Maintenance incentives on any other basis than direct standards are usually so loose and vague from a control standpoint that they should be subjected to a careful study before they are given serious consideration.

CONCLUSION

This chapter has provided a brief discussion of some of the problems involved in making wage incentive installations for service occupations together with suggested approaches to the solutions of these problems. The importance of devoting sufficient time, as well as thought and energy, to the solution of the problems of developing a strong wage incentive plan has also been emphasized. If the plan is to be successful every factor affecting the operation or operations involved must be fully weighed and considered. This thoroughness need not complicate the plan unduly as ways and means can be found to compensate for each factor in a relatively simple manner.

CHAPTER THIRTEEN

Supervisory or Keyman Incentives

DEFINITION

Supervisory or keyman incentives, as generally understood, are designed to award a bonus to a supervisor in proportion to his ability to control costs, quality, waste, and other factors for which he and his department are directly responsible.

The weight a particular department bears in the overall plant cost results must be included in the total consideration of the supervisory incentive plan to be used in that department. The amount of bonus earned under such a plan can be used as an overall measure of the department's efficiency, provided a sound basis for the plan has been established.

SHOULD SUPERVISORS BE PLACED ON INCENTIVE?

This is a much debated point, with the majority of opinions at present probably being against placing supervisors on incentive. However, the major reason for opposing such incentives has likely been the failure in earlier installations to consider fully what factors should compose an equitable incentive plan for supervisors. Then, too, the lack of care, analysis, and maintenance that went into the earlier

installations made them as unsatisfactory in operation as it did any other incentive plan.

The argument is often advanced that a supervisor should not be paid a bonus to do what he was hired to do. This argument, and the one that it detracts from his dignity, are largely academic. No one can deny the stimulating effect of a well-designed financial incentive in encouraging the attaining or exceeding of equitably established goals. This stimulating effect is not lost on a man merely because he is a supervisor any more than it is lost on the president of the company. The main problem is to design a properly balanced basis for the plan. If this is done the possibilities for good results from placing supervisors on incentive far outweigh the possibilities for bad results.

Another point often advanced against such plans is that they cause the supervisors to be constantly pressing for more liberal standards, thus making an unhappy situation in their relations with staff departments. This possibility cannot be denied any more than can the possibility that such a plan will encourage a supervisor to put too much pressure on his workers and to slight the maintenance and upkeep of his department in order to obtain a better cost picture.

Either of these possibilities would soon be detected in actual practice and corrective measures would be taken. When the proper type of trained individual is in a supervisory position, an incentive plan of the kind we are discussing tends to stimulate his qualities of leadership and fairness rather than the subversive qualities mentioned.

It is true of keyman incentives, as it is of any phase of management, that the closer the businessman strives for and comes to the optimum control of his business the higher degree of accuracy in controls he must attain and the higher the quality of managerial thinking and action he must exercise. If this be the case and goal then the beneficial results of such practices as keyman incentives can be obtained. If it is not the case and goal then it is best that he leave this and other managerial refinements to those who are willing to pay the price of progress.

GENERAL DISCUSSION OF KEYMAN INCENTIVES

In our discussion of this type of incentive we shall confine our remarks to its application in departments where measured standards are in use for incentive purposes.

An incentive plan for supervisors should be kept as simple and easily understandable as practicable. It should be designed so that performances can be taken directly from current bonus, efficiency, and budget records and reports in order to facilitate calculations. The

plan should be designed to control departmental wastes, quality, and costs. Care must be exercised to avoid prematurely instituting a keyman incentive plan before sufficient incentive coverage has been made and a thorough study of material usage, spoilage, and quality has been completed, thus insuring equitable standards.

Keyman incentives should recognize the fact that a supervisor is essentially the manager of his department, and it is his responsibility to see to it that those items affecting costs and quality are kept in line with the measured standards established in the departmental wage incentive and budget plans. It is essential to the success of a keyman incentive plan that measured standards be used in every possible instance. When necessary to use past performance as a guide in establishing a standard, the engineer must subject such data to a thorough analysis to determine what should be included and what should be excluded from the standard.

Designing the Keyman Plan

MAJOR CONTROL FACTORS

The first step in instituting a keyman incentive plan is to determine the major control factors against which actual performances on cost, quality, and wastes can be measured for improvement or lack of improvement. This control of costs may mean the selection of such key relations or factors as per cent departmental budget efficiency, per cent plant budget efficiency, per cent bonus earned by departmental employees on incentive, per cent non-incentive time, per cent waiting time, per cent spoilage, and the like, which indicate trends of costs and control in those items affecting costs and production standards.

The control of waste may mean the establishment of control standards based on a thorough analysis of the causes of waste. This would include an analysis of past performance to compare it with the conclusions reached in the waste analysis and thus to determine improvement expected and savings to be realized. The materials used, and the manufacturing process as well, should be analyzed to determine whether or not individual or group controls should be established by operations.

The control of quality may be obtained through the establishment of spoilage standards for pieces partially or completely spoiled. Here, again, the analysis of the causes of spoilage must be made before

DEPARTMENT A

KEYMAN BONUS AWARD CHART

Departmental Bonus Earned		Non-incentive Plus Waiting		Plant Budget Efficiency		Departmental Budget Efficiency		Direct Materials Used	
(A) Dept. % Bonus	(B) Supvrs. % Bonus	(A) % Non-inc. + % Wait.	(B) Supvrs. % Bonus	(A) % Budget Effcy.	(B) Supvrs. % Bonus	(A) % Budget Effcy.	(B) Supvrs. % Bonus	(A) % Stand. Usage	(B) Supvrs. % Bonus
−1 to 10	−0.5								
0	0								
1	+0.2								
2	+0.4	50	−6.0						
3	+0 6	48	−5.0			92.5	−7.5		
4	+0.8	46	−4.0	89.0	−6	93	−6.5		
5	+1.0	44	−3.5	90.0	−5	93.5	−5.5	110	−9
6	+1.2	42	−3.0	91.0	−4	94	−4.5	109	−7
7	+1.4	40	−2.5	92.0	−3	94.5	−3.5	108	−5
8	+1.6	38	−2.0	93.0	−2	95	−2.5	107	−3
9	+1.8	36	−1.5	94.0	−1	95.5	−2.0	106	−2
10	+2.0	34	−1.0	95.0	0	96	−1.5	105	−1
11	+2.2	32	−0.5	96.0	+1 0	96.5	−1.0	104	0
12	+2.4	30	0	97.0	+2 0	97	−0.5	103	+1.0
13	+2.6	28	+0.5	98.0	+3.0	97.5	0	102	+2.5
14	+2.8	26	+1.0	99 0	+4.0	98	+1.0	101	+4 0
15	+3.0	24	+1.5	100.0	+5 0	98.5	+2.0	100	+5.0
16	+3.2	22	+2.0	101.0	+5.5	99	+3.0	99	+5.5
17	+3.4	20	+2.5	102.0	+6.0	99 5	+4.0	98	+6.0
18	+3.6	18	+3.0	103.0	+6.5	100	+5 0	97	+6.5
19	+3.8	16	+3.5	104.0	+7.0	100.5	+5.5	96	+7.0
20	+4.0	14	+4.0	105.0	+7.5	101	+6.0	95	+7.5
21	+4.2	12	+4.5			101.5	+6.5	94	+9.0
22	+4.4	10	+5.0			102	+7.0		
23	+4.6	8	+6.0			102.5	+7.5		
24	+4.8								
25	+5.0								
26	+5.2								
27	+5.4								
28	+5.6								
29	+5.8								
30	+6.0								

Select performance column (A) for each factor; read corresponding % bonus from column (B). Total % bonus to be paid the supervisor is the sum of the factors (1), (2), (3), (4), and (5). Plus bonuses are to be added, minus bonuses are to be subtracted in obtaining the total.

FIGURE 9

establishing the standard and only that amount considered as inherent in the operation allowed. If the department is fully covered by incentive standards, this information is readily available.

After the major control factors are determined, consideration is given to the weight that will be assigned each factor in making up the total bonus to be awarded for normal performance. For normal performance the sum of all factors should equal 25 per cent bonus to be paid to the supervisors. This amount is in keeping with our

recommended bonus percentage for hourly workers. The point of average performance, where no bonus is paid, and points of subnormal performance, deducting from bonus earned on other factors, should also be determined and established.

As stated, the summation and analysis of data used in developing such factors as waste and spoilage do, in most cases, consist of reviewing the data developed during the study and establishment of measured standards in the department.

KEYMAN BONUS AWARD CHART

A Bonus Award Chart should be prepared showing the bonus to be awarded for varying performances under each factor. Figure 9 is a sample of such an award chart. This chart should be kept as simple as possible and prepared in such a manner that the bonus can be read directly for any performance. The total per cent bonus paid the supervisor should be the sum of the per cent bonus under each factor. Plus bonuses should be added and minus bonuses should be subtracted in obtaining a total bonus to award the supervisor. For example:

	Supervisor's Bonus
Departmental % bonus (22)	4.4
% Non-incentive, plus % waiting time (13.0)	4.3
Plant budget efficiency (97.0)	2.0
% Departmental budget efficiency (98.5)	2.0
% Direct materials used (103)	1.0
Total % bonus to be awarded to the supervisor	13.7

GENERAL POLICIES GOVERNING OPERATION OF PLAN

1. The per cent bonus earned by the supervisor should be calculated monthly. Each supervisor should be informed of his earnings as soon as they are determined. (See Figure 10 for the sample of the notification form.)

2. Bonus earned should be accumulated for 6-month periods. The purpose of this policy is to let the money accumulate so that it represents a sizable payment when it is made. Usually such payments are made June 1 and December 1, just before vacation and just before Christmas. Such a policy is entirely optional and is usually decided by a majority vote of the supervisors participating.

REPORT OF KEYMAN BONUS EARNINGS

Copies to: Plant Manager
Payroll Department
Industrial Engineering Department
File

Plant No. 3
Location Dallas
Department A
Supervisor Brown

Period Ending Sept. 1, 1958

Bonus Factor	Actual Performance	% Bonus Earned	% Possible Earnings Normal	% Eff.
(1) % Departmental Bonus	15%	3	5%	
(2) % Non-incentive Plus % Waiting Time	22%	2	5%	
(3) % Plant Budget Efficiency	100%	5	5%	
(4) % Departmental Budget Efficiency	99%	3	5%	
(5) % Reduction in Materials Used	95%	7.5	5%	
TOTAL		20.5	25%	

APPROVED: Plant Manager John W Able
Plant Chief Industrial Engineer Ward Brown

FIGURE 10

3. The amount of bonus to be awarded should be the per cent bonus for each month times the supervisor's monthly base salary.

4. Monthly records should be wiped clean. There should be no carryovers of negative performance from one month to another.

5. All other policies should conform to the standard policies regulating the payment of bonus as discussed in Chapter Seven.

PER CENT BONUS EARNED

SIX-MONTH SUMMARY

DEPARTMENT A KEYMAN INCENTIVE PLAN

	Departmental Bonus Earned		Non-incentive Plus Waiting		Plant Budget Efficiency		Dept. Budget Efficiency		Direct Materials		Total % Bonus Earned
	Dept. % Bonus	Supvr. % Bonus	% Non-inc. Plus Waiting	Supvr. % Bonus	% Budget Effcy.	Supvr. % Bonus	% Budget Effcy.	Supvr. % Bonus	% Standard Usage	Supvr. % Bonus	
Dec.–June	14.4	+2.9	40.9	−2.7	97.0	+2 0	96.5	−1.0	102.0	+2 5	+3.7
Jan.–July	16.0	+3.2	36.5	−1.6	98.5	+3.5	99.6	+4.0	100 0	+5.0	+14 1
Feb.–Aug.	16.8	+3.4	36.0	−1.5	95.0	0	97.2	−0.5	105 0	−1.0	− 0.4
March–Sept.	17.3	+3.5	32.2	−0.5	97.5	+2.5	99.7	+4.0	104.2	0	+ 9.5
April–Oct.	16.1	+3.2	36.6	−1.6	94 0	−1.0	95 8	−1.5	99 0	+5 5	+ 4 6
May–Nov.	15.8	+3.2	37.6	−2.0	96 5	+1.5	96.7	−1.0	101 5	+3 2	+ 4 9
Six-Month Average	16.1	+3 29	36.6	−1.6	96 4	+1.4	97 6	+0.70	102 0	+2.5	+ 6.2

FIGURE 11

CHECKING THE PROPOSED PLAN AGAINST ACTUAL PERFORMANCES

In order to check the mechanics of the keyman incentive plan against actual operations, a table such as that shown in Figure 11 should be prepared. Comparisons can be made quickly of total month-to-month performance, and the factors producing high and low bonuses may be easily selected for closer analysis.

DETERMINATION OF NORMAL AND AVERAGE PERFORMANCE UNDER EACH FACTOR AND THE WEIGHT GIVEN IT

The point of incentive (25 per cent bonus point) and average (0 per cent bonus point) performance under each factor is determined from data developed and used in establishing standards and controls for use in the departmental wage incentive plan. Should there be a factor not covered by measured standards and not adaptable to measured standards, a thorough analysis of the conditions affecting that factor, and past performances on it, should be made to insure including only data substantiated by fact as being inherent in that factor.

The weight allowed each factor should be finally determined after the amount of money controlled by each factor and the potential savings have been analyzed. It may be found that some factors affect departmental costs more materially than others and, therefore, it is advisable to allow greater weight to one factor than another. For example, a 10 per cent fluctuation in non-incentive and waiting time may not influence costs so much as a 5 per cent fluctuation in materials used. Yet, care must be taken to allow sufficient weight to each factor to insure its not being disregarded by the supervisor without its seriously affecting his bonus. The extent to which improved performances may be expected and whether or not one factor will conflict with another may contribute to the weights selected.

DETERMINATION OF BONUS AWARDS FOR VARYING PERFORMANCES UNDER EACH FACTOR

To determine the amount of bonus to be awarded for various performances under each factor, an analysis should be made of at least one year's performances under each control factor. This study will give some indication of the degree of emphasis to be placed on the

various increments of the spread between average and normal performance, as well as penalties or rewards for exceeding these limits.

1. Departmental Bonus Earned Factor

In the case of the departmental bonus earned factor the problem is relatively simple. Twenty-five per cent bonus earned by the workers on standards represents normal performance for them, and likewise represents normal performance for a department and for a supervisor. If it is decided to assign a weight of 20 per cent (5 per cent bonus) of the total of all factors to this factor to the supervisor for normal performance, then the 25 per cent departmental bonus performance will be set opposite 5 per cent supervisor's bonus, on the scale set up for it. Furthermore, since no bonus would be earned by the supervisor for 0 per cent departmental performance on this factor, we have the two necessary points in establishing a bonus award scale, namely, the point of normal performance and the point of average performance. The increment of increased or decreased departmental per cent bonus would be 0.20 per cent (5 per cent ÷ 25 = 0.20 per cent).

2. Departmental Budget Efficiency Factor

(A) General Comments. The use of budget efficiency as a factor involves several problems. The budget controls all items of cost and expense in the department, which means that there will be a duplication of control on many of the cost items. For example, direct labor is on incentive and therefore would be controlled by the departmental bonus earned factor in addition to the budget efficiency factor.

In order to place proper emphasis on those accounts which have no other control than the budget, it appears advisable to separate these accounts from the others and base the budget efficiency factor on them alone. Cost accounts in a department that are controlled through no other source than budget efficiency are called single-controlled accounts for the sake of simplicity. Cost accounts that are also controlled by incentive systems, materials used efficiency, or the like, are called multicontrolled. Should this breaking out of single-controlled accounts not prove practicable in a given circumstance, there are other methods of handling this factor in a satisfactory manner, discussed in the following pages.

(B) Average and Incentive Limits. Budget efficiencies are determined from budget allowances versus actual costs. For the sake of example, assume that 100 per cent budget performance is the expected attachment and a 2½ per cent variation is considered the extreme

through which costs should vary from budget allowances in a particular department. Then, 100 per cent less 2½ per cent, or 97.5 per cent budget efficiency can be established as the point of average performance.

If it is decided to assign a weight of 20 per cent (5 per cent bonus) of the total of all factors to this factor for incentive performance under budgets, 1 per cent bonus will be awarded for each 0.5 per cent variation (5 per cent ÷ 5 = 1 per cent) between 97½ per cent and 100 per cent budget efficiency. It may be decided to vary the degree of allowance for performances out of the 97 per cent to 100 per cent range, in order to encourage supervision to stay within these limits. This would depend, to a large degree, on the possibility of a more or less wide swing of budget efficiency being inherent in a particular department's operation.

If the single-controlled accounts are separated from the multi-controlled, such a spread from average to incentive of 97.5 per cent to 100 per cent budget efficiency could be set up for these accounts alone and calculated on that basis. This would simplify the development of the budget factor scale.

(C) Use of Overall Budget Efficiency. If it is recognized that it might be simpler to use the overall department budget efficiency than to separate the accounts controlled only through the budget, the following procedures have been developed.

If overall budget efficiency is used as a factor in the keyman incentives, it would be possible for the supervisor to pay little attention to the single-controlled accounts when they represent a small portion of the total, and still obtain a good budget efficiency if the scale of earnings under this factor is not properly weighted. Thus, proper weighting must be given these single-controlled accounts in establishing the bonus scale for this factor. If the factor is developed properly, the overall budget efficiency may be used directly as shown on the cost and budget reports.

If 100 per cent is expected attainment for the budget efficiency factor and 97.5 per cent budget efficiency is the break-even point, it is only necessary to work out the variation permissible in order to provide the proper weight to the single-controlled accounts. As stated, if all accounts are single controlled, then the 2½ per cent spread would be used in developing the scale. If all accounts are not single controlled, proper weighting for varying percentages of single-controlled accounts, as compared with the total number of accounts and their relative value, must be provided as indicated in the following tables.

10%	single-controlled		costs	0.25%
20%	"	"	"	0.50%
30%	"	"	"	0.75%
40%	"	"	"	1.00%
50%	"	"	"	1.25%
60%	"	"	"	1.50%
70%	"	"	"	1.75%
80%	"	"	"	2.00%
90%	"	"	"	2.25%
100%	"	"	"	2.50%

Allowable variation in budget efficiency between incentive and break-even or average points.

The above figures were determined from the following formula, which assumes that 100 per cent budget efficiency will be attained on those accounts controlled by other factors such as an incentive plan.

$$\text{Weighted \% department budget efficiency} = \frac{(\text{\% multicontrolled costs} \times 100\% \text{ budget efficiency}) + (\text{\% single-controlled costs} \times 97.5\% \text{ budget efficiency})}{100\% \text{ multicontrolled and single-controlled costs}}$$

If it is assumed that 20 per cent of a department's costs were controlled by no other factor than budget efficiency, our allowable variation between incentive and break-even performance would be 0.50 per cent, as indicated in the preceding table.

The scale for the budget efficiency factor might then be as follows:

Department Budget Efficiency, %	Supervisor's % Bonus	Department Budget Efficiency, %	Supervisor's % Bonus
94.5	−7.5	99.5	0
95.0	−6.5	99.6	+1.0
95.5	−5.5	99.7	+2.0
96.0	−4.5	99.8	+3.0
96.5	−3.5	99.9	+4.0
97.0	−2.5	100.0	+5.0
97.5	−2.0	100.5	+5.5
98.0	−1.5	101.0	+6.0
98.5	−1.0	101.5	+6.5
99.0	−0.5	102.0	+7.0
		102.5	+7.5

There is one danger in using this device. If multicontrolled accounts are below 100 per cent efficiency to any degree, the penalty under this factor could be unduly severe because this poor performance would also be reflected unfavorably in the other factors making up the total keyman plan, thus inflicting a double penalty.

An alternative plan for using overall budget efficiency and yet applying the proper weight to these single-controlled accounts would be to hold the 97.5 per cent and 100 per cent spread from average to incentive and vary the increments within that spread to reflect the single-controlled accounts properly. Such a scale might appear as follows:

Department Budget Efficiency, %	Supervisor's % Bonus	Department Budget Efficiency, %	Supervisor's % Bonus
94.5	−7.5	99.0	+1.5
95.0	−6.0	99.5	+2.5
95.5	−4.5	99.8	+4.0
96.0	−3.0	100.0	+5.0
96.5	−2.0	100.5	+5.5
97.0	−1.0	101.0	+6.0
97.5	0	101.5	+6.5
98.0	+0.5	102.0	+7.0
98.5	+1.0	102.5	+7.5

The principal advantage that this scale might have is that it does not offer so severe a double penalty should one or more of the multi-controlled accounts be below incentive as does the other scale. Yet this scale does emphasize the importance of the single-controlled accounts by the sharp increase in bonus earnings between the 99.5 per cent and 100 per cent budget efficiency.

The exact make-up of any scale for a department depends upon the findings of the analysis made in that department, and these scales are used only as examples.

3. Overall Plant Budget Efficiency

It is important that an overall plant factor be included in each supervisor's bonus plan, a practice which tends to ensure the supervisor's keeping in mind his relations with the rest of the plant. If this is not done, a supervisor, in driving for lower costs in his own department, may adversely affect the costs of other departments in the plant. This factor, then, is designed to keep before him his responsibilities in the overall plant cost picture as well as his own department.

The value this factor should have in a supervisor's bonus plan depends upon the influence his departmental costs have on the total plant costs. If his department accounts for 20 per cent of the plant total, the factor should carry a 20 per cent weight (5 per cent) in his bonus calculations. Should some unusual circumstance exist where the actual cost relationship of a department is low but its ability to influence processing costs in other departments is high, additional weight may be given the factor.

4. Reduction in Materials Used Factor

In those departments where materials represent a sizable portion of the total cost, and the amount of materials used can be controlled, a separate factor reflecting progress in this respect should be set up. These controls may be based on using only specified amounts and kinds of material or developing methods whereby less material can be used. Here, again, the data to be analyzed in establishing this factor will be found largely in the data used in establishing the measured standards and controls for use in the department budget and incentive systems.

Where necessary to use past performance as a source of data, care must be exercised to eliminate all data not justifiably a part of the accredited data to be used in establishing the standard. A study of each individual department's problems will determine how the standards can best be determined and applied and the nature of the scale that will be set up for this factor. It is important to consider the potential money savings in establishing both the weight of this factor and the spread of the scale established to control it.

Another point that may influence the weight given this factor, in addition to actual material usage, is the ability to control and measure this usage by operations. If it is difficult or impossible to control this factor by operations and thus make it a direct part of the regular departmental incentive plan, it may be necessary to increase materially the weight of the factor in the supervisor's incentive plan. Thus it would become a major responsibility of the supervisor to concentrate on these factors in order to prevent undue waste and spoilage.

5. Spoilage Factor

Spoilage being a factor in nearly all operations, the data developed in conjunction with establishing measured standards will be readily available and usable in establishing the average and incentive performance allowances for this factor. Here, again, an analysis of past performance gives some indication of the degree of variation in spoilage that has been experienced and thus aids in setting up the control scale. Such a comparison also indicates the potential savings under this control.

6. Non-incentive Plus Waiting Time Factor

When the state has been reached in the incentive installation in a department where it is time to place the supervision on bonus, the potential degree of incentive coverage should be known. The number

of operations that do not lend themselves to being placed on incentive will vary between departments, but they can be designated and their relations to the whole definitely established.

This potential percentage of coverage plus an allowance for unavoidable waiting time, if any, should establish the incentive point for this factor. The average point is determined largely by analyzing the possible influx of new work that would require time to place on standard and the steadiness of the flow of this new work. The fact that the factor is designed to encourage the supervisor to see to it that his coverage is kept at maximum, and his waiting time at a minimum, should be kept in mind in establishing the scale for it.

7. Checking the Factor Bonus Scales

After the scales for each factor have been determined and are in somewhat the same order as indicated on the bonus award chart (Figure 9) maximum bonus and maximum penalties should be checked in order to have the table as a whole somewhat in balance. Figure 9 awards a maximum bonus for all factors of 36.0 per cent and a maximum penalty of 33.5 per cent, although no attempt is made to establish maximum earnings limits.

SOURCE AND DESCRIPTION OF EACH FACTOR

It should be possible to take the information required to calculate the supervisor's incentive directly from established control reports. They would include the daily bonus reports, daily, weekly, or monthly budget reports, and other types of reports and records as described in Chapter Fifteen.

OTHER CONTROL FACTORS

Other control factors that might be used are the relation of direct labor to indirect labor, the decrease in cost per standard hour, the per cent capacity operated, and the like. Since these factors may be duplications, in one way or another, of the factors indicated above, or cannot be directly controlled by the supervisor, considerable thought should be exercised before including them in the plan. In some departments, however, some other factors may be instituted for the purpose of correcting a particularly bad condition, but it is usually desirable to limit the number of factors to five.

CONCLUSION

The particular plan, as outlined, is relatively simple and easy to administer. It attempts to solve the problem of rewarding a supervisor in proportion to his ability to improve performances on each major cost factor in his department. The various performances on these factors can be obtained from current reports with a minimum of extra work. The design of the plan is such that it eliminates the necessity for developing various efficiencies which would parallel control factors already established for waste, quality, and other costs from an overall viewpoint.

This particular plan is not necessarily the only one or type of plan that can be successfully used. However, in this discussion of it we hope that we have illustrated the problems involved in developing a supervisor's incentive plan as well as offering a possible solution. A final word of caution in the use of supervisor's incentive plans is due here, to the extent of urging again that the controls used as the basis for the plan be balanced and sound. If a control is out of line or unsound in any manner it should not be used. Again, rigid maintenance is the watchword once the plan is placed in effect.

PART FOUR

Operating the Incentive Plan

Once the technical preparations have been made and the proper management climate and employee cooperation have been established, it is then possible to proceed with the installation and operation of the system.

Nothing is more important to a wage incentive plan or the hourly base rate structure plan than its maintenance. We know that, regardless of how carefully and accurately a rate structure or wage incentive plan is developed originally, it will surely fail in its practice if it is not rigidly maintained. This is true because the conditions under which wage incentive plans and hourly base rate structure plans are founded do not remain static. Therefore the plans themselves cannot remain static. Normal and regular means must be clearly and definitely established so that all changes are fully weighed as to their effect on existing wage structures and that the proper adjustments indicated are made. If this is not done, the plans soon become obsolescent and out of balance. Such a condition as this quickly leads to discontent and loss of faith on the part of the hourly employees.

The need for such maintenance must be clearly recognized by

management at the very beginning of a wage program in a plant. Adequate provision must be made for it, and nothing should be permitted to interfere with it or disrupt it. At first glance this is an obvious requirement, but experience has proved that it is too often disregarded. The pressure of work in the industrial engineering department itself and the demands of management for special analyses and the like make it difficult to resist letting the work of wage maintenance slip. Therefore it is management's responsibility to see to it that their demands for studies and analyses do not harm this vital phase of wage administration. It is also the responsibility of the engineers, supervision, and hourly employees as well, to guard against harmful inroads on the time and means required to maintain their wage plans properly by insisting that such inroads be stopped.

The successful maintenance of the incentive system further requires a constant evaluation of the results obtained. The inauguration of a cost control program will provide much essential information useful in the evaluation. Such an evaluation may indicate the need for extensive revision or even temporary abandonment of the incentive system in part or completely. This section will provide consideration of these factors.

CHAPTER FOURTEEN

Wage Incentive Administration

The basis for a sound wage administration program requires first of all the use of a sound comprehensive hourly base rate structure plan and a balanced, well-thought out incentive plan. These plans must not only be comprehensive in scope and content but must also be designed for thoroughness of administration.

Of especial importance to successful administration is the establishment of standard practices regarding the procedures to be followed. This would include the development of a manual of procedure, the method of handling changes, the assignment of responsibility, and the specification of the scope of the program.

THE MANUAL OF PROCEDURE GOVERNING THE INSTALLATION

In instituting a wage incentive plan, for example, a manual of procedure should be prepared to give a clear description of the plan, its policies, controls, and standards. It should include, further, a statement of the purpose of the plan, its scope, and the expected earnings on the part of employees.

POLICY SECTION OF THE MANUAL. This manual should also include a general policy section, as described in Chapter Seven. These policies are used to govern all wage incentive plans in use in the plant and should

be clearly and completely stated. A special policy section is included if the installation is of such a nature that it must have special treatment, as would be required by unusual situations in participation, delays, basis of payment, and the like. These situations may be the result of some unusual features of the manufacturing conditions, materials, or equipment. Herein also should be listed any probable changes that affect either the production standards or the nature of the installation. These special policies should be listed by production centers for sake of clarity and ready reference.

Bonus Accounting Section. The bonus accounting section of the manual should cover in detail the exact steps involved in gathering production data and calculating bonus earnings. The section would include sample bonus calculations covering at least the more common examples by production centers, if not all of them.

Methods and sources of securing and checking daily production information, including samples of all forms, must be included. It is essential to good bonus accounting practice that both the method of obtaining production counts and the method of checking the accuracy of those counts should be given. This is more important than it appears to be at first glance. Every effort must be made to plug any and all possible loopholes in obtaining accurate production counts quickly. A detailed description of all necessary calculations, including the provisions and regulations concerning the posting of bonus information, should be given. This would include the various allowances for delays and variations in work, materials, and equipment.

Participation Section. The participation section should show not only who participates and on what basis, but also the production unit or units from which the production count is derived. The type of set-up, that is, group or individual bonus, should be designated by operations or group of operations.

Standards Section. The standards should be supported by detailed data, organized and compiled in such a manner as to be of ready reference. Each standard should be written up in a clear concise manner, with copies provided the department head as well as the accounting department. (See Figure 4.) The form used in preparing this report should state clearly what operation the standard is for and should include a designating description.

The specification of work covered by the standard should include a complete description of the operation, the tools and equipment used, the inspection requirements, and the spoilage standards, if any, existing at the time the standard was set. Thus at any future time it can be established beyond a doubt just what conditions existed at the time

the standard was set. Then if any changes have been made from the procedure as outlined, the standard automatically becomes obsolete, and a new one should be requested.

This description becomes the authority to use the standard when properly signed, and can be known as the standard authority. To become effective it should be signed by the foreman of the department, the plant manager, and the engineer issuing the authority.

THE PROBLEMS OF PROPER ADMINISTRATION OF A WAGE INCENTIVE PLAN

Changing Work Requirements. The problems of proper maintenance or administration of a wage incentive plan are many and require painstaking and vigilant follow-up. One of the greatest of these problems is changing work requirements, and care must be taken to see to it that if the work requirements in an operation change, the standard is also changed. These changes in work content are frequently of a creeping nature. That is, individually they are not major changes but as a group or as a whole become important.

The majority of the errors or obsolescence found in standards are on the loose side. This is true because there is usually more likelihood that the amount of work required will diminsh rather than increase. Thus it requires vigilance on the part of the supervision and the engineers to see to it that these changes are known and measured as they occur. The supervision must guard against a natural tendency to encourage a general slight loosening of standards in order to have his departmental performance look better, as well as to favor his employees. Experience has shown that standards must be kept exactly up-to-date to the degree possible and practical. If this is not done, we soon find our old enemy, inequality of standards, again in our midst.

Obviously, allowances and changes in standards to reflect added work present no problem. The hourly employees themselves will usually see to it that these changes and conditions are promptly accounted for in the standards, if the engineers and supervisors show any laxity in that respect. Naturally, we cannot expect from them the same zeal to have reductions in standards when work is taken out of the operation. The engineers and the supervision must depend largely on their own initiative to maintain the proper balance in this direction.

What Constitutes a Methods Change in Manual Work. Considerable litigation has arisen over misunderstandings as to what actually

constitutes a methods change. Many of these problems have arisen because of poorly written descriptions of the method employed at the time the original standard was established. These can, of course, be avoided by continual vigilance in the preparation of the descriptions. The predetermined elemental time systems have provided an extremely valuable technique when used for this purpose.

Methods, insofar as the manual elements of the work are concerned, basically involve the motion pattern employed. If the best motion pattern is used, greater productivity is the result. The individual's skill is an additional element in output because the proficiency with which an employee follows the motion pattern or method established on the job depends on skill.

More specifically, *method is the motion pattern that can be described in sufficient detail to enable another qualified individual to follow the same motion pattern. Therefore, a methods change is a change in motion pattern that can likewise be described.*

Allowing Average Earnings for Non-standard Operating Conditions and During Change over Periods. There has been a growing tendency in recent years to allow average incentive earnings whenever non-standard operating conditions are caused by "no fault of the operator." As a gesture of good will on the part of management as a recognition of the operator's cooperation, this may have merit for an occasional application for extremely short periods. This practice is, however, directly opposed to the basic concept of incentives. Experience has shown that it quickly leads to the thought that the employee has a "right" to incentive pay rather than an opportunity to *earn* extra pay. A similar phenomenon occurs when full incentive allowance is made for machine time on machine-paced jobs. This is discussed in considerable detail in Chapter Eleven.

Planned Changes. Most changes in conditions, especially those of a major sort, are known and planned. This is true whether the change is one of materials, specifications, equipment, methods, or tooling. Regardless of whether these are of a sort to increase or decrease a standard, they do not present a major administration problem because they are known and planned changes. A full discussion and an explanation of the change to the employees concerned before any actual change is made usually gain their acceptance of the change. *The important point is to make these changes as they occur.* The difficulty in making a change downward increases geometrically to the length of time the old obsolete standard is permitted to remain in effect after the change obsoleting it has been placed in practice.

When the change is the result of a suggestion or improvement worked

out by an operator, the suggestion is often made to leave the old, now loose, standard in effect for a definite period as a reward to the employee. *This is distinctly bad practice.* Under no circumstances can such a gesture be justified. Let an outright monetary reward be given the operator for his idea based on the savings resulting from it, but change the standard the proper amount as soon as the change in the operation is put in practice.

CREEPING CHANGES. The problem of handling small or creeping changes in the operation is the most difficult one to handle. Even when known, these changes present a problem in sound wage administration. The average supervisor and engineer are reluctant to make a change in a standard every time some small change in the operation occurs. It is disturbing to the employees and also requires making a number of clerical and data changes. At the same time the changes cannot be ignored.

There are different ways of handling this problem, but this one has proved successful. Recognizing that many of these changes affect the standard only to the degree considered to be within the realm of accurate standard setting, we should establish a policy as to what shall be the minimum adjustment that will be made in a standard. This limit can be 10 per cent. In other words, if the change in question affects the standard less than 10 per cent the standard is not changed.

The change and its effect on the standard are, however, entered on the back of the standard authority in question, with the date of the change shown. This entry is initialed or signed by the foreman, the employee or employees affected, the engineer, and the union steward if there is one. Then, as each small change is made, the same procedure is followed. When the next change added causes the accumulated changes to equal or exceed 10 per cent, the standard is adjusted to compensate for the whole of them. Thus the slate is wiped clean at one time. This practice is essentially fair to all concerned, permits proper maintenance of standards, and at the same time is practical from a clerical and data maintenance viewpoint.

THE ASSIGNMENT OF RESPONSIBILITY FOR THE PROGRAM

A regular follow-up or maintenance program should be instituted the moment the wage incentive plan is placed in operation. The responsibility for this work should be assigned to an engineer, preferably one that worked on the installation. He should be provided whatever additional help he needs to do a good, thorough job.

As stated, this program is important from an employee relations standpoint. A regular follow-up permits the immediate measurement and adjustment for any changes made and prevents loose application of standards which, if ignored, would distort the value of the plan to both the hourly employees and the management. A close follow-up prevents any minor irritation from growing into a major one. Sufficient time should be provided to permit the engineer to work with each operator or group of operators to ensure that they are fully trained in the proper method of performing the work to which they are assigned. Follow-up of this nature does much to help convince the employees of the essential fairness of the installation and of the management's desire to make it fully acceptable to them.

This matter of allowing the engineer sufficient time and assistance to do a thorough maintenance job is also important from the standpoint of making further methods improvements. Additional recommendations for improvement in work methods usually come to light as a natural result of the wage incentive installation. A diligent follow-up permits the necessary cataloging and analysis of these recommendations for their possible value and effect upon the standards in force. It also encourages the continuance of recommendations by both supervision and hourly workers. Often recommendations are submitted in great quantities by the employees during the installation period. Afterwards suggestions are few. The engineer assigned to this work should bend every effort to help the supervision keep the general cost reduction program alive and before the employees as a vital program.

THE SCOPE OF THE WAGE INCENTIVE ADMINISTRATION PROGRAM

The scope of the wage administration or maintenance program should be established by the department head, the engineer, and the head of the industrial engineering department. One of the first steps in this process is to list, in order of their importance, all items that in the opinion of that group should have further analysis. These special items or projects would be included along with those which could be considered as regular items. These regular follow-up items should include the following:

1. Make a Periodic Audit of Bonus Accounting and Procedures

This audit is to ensure accuracy of bonus accounting as well as to seek refinements and simplifications in procedure.

2. Analyze Daily the Unsatisfactory or Unusual Performances Above and Below the Expected Bonus Percentages

This is done to seek correctives and to check adequacy of standards. The need for further training of an employee or employees would be discovered. It is essential that the cause or causes of these unusual variances be determined promptly and that corrective action be taken promptly.

3. Hold Periodic Meetings with the Supervision to Discuss Improvements in the Installation and Other Cost Reduction Plans

It must be kept in mind and kept in reality that the supervision is the guiding light in the never-ending campaign for lower costs. Therefore, it is essential that meetings be held at frequent intervals to keep its participation vibrantly alive.

4. Make Studies and Develop Data Covering New Items Not on Incentive as Well as Changes in Established Methods

These studies are made to keep the incentive coverage at the highest level possible and to keep all standards current.

5. Issue All New Standards and Changes in Current Standards

6. Continue Development of Standard Data to Improve Their Accuracy and Scope

This will permit more rapid incentive coverage and maintenance with a minimum number of time studies being required.

7. Make Periodic Reviews of All Standards and Allowances Against Production to Check Their Accuracy

8. Check Effect of All Specification, Method, and Equipment, Changes on Standards and Standard Data

9. Prepare or Cause to Be Prepared Progress and Performance Reports of a Control Nature

10. Investigate All Proposed New Methods and Processes Designed to Improve Production and Make Recommendations Concerning Them

11. Maintain a Log of All Changes and Improvements Made in the Department

Preventive maintenance also pays in the case of wage incentive plans. It is much simpler and much easier to maintain incentive stand-

ards properly than it is to attempt to correct an unbalanced situation in regard to standards of work after they have reached the point of becoming employee grievances.

Of all the factors that affect sound wage administration, the most important by far is the recognition by management of its need and importance, and then the translation of that recognition into determined positive action.

CHAPTER FIFTEEN

Cost Control Reports

One of the major elements of an industrial engineering program, of which wage incentives are a part, is to provide management with simple and adequate cost control reports. Thoroughness and accuracy must be the watchwords of those who develop the bases for these reports as well as for the reports themselves.

The soundest basis for such a report is the comparison of actual performance with standards which are measured. When this is the case, the degree of accuracy of the comparison is much higher than if the standards were based on past averages, estimates, or the like. Standards that are measured have been analyzed, classified, and weighed both quantitatively and qualitatively so that there can be little doubt of their contents. Thus they can be used and relied upon with greater confidence than if they were determined by some other method.

To guard against too much detail and too many reports, the exception principle should be used in the development of these control reports wherever practicable. By the exception principle is meant that the report be prepared only in those instances when the actual fails to meet the standard.

For the purpose of control we shall discuss four basic reports which, in addition to budgets, will to a large degree provide management with sound controls. Should these four not be sufficient in any given

situation, we must design others to augment them, striving always for simplicity. The four reports described in this chapter are:

1. Performance and Cost Reduction Report.
2. Record of Hours Worked and Bonus Earned.
3. Excess and Waiting Time Reports.
4. Excess Cost Reports.

The first two are regular periodic overall control reports; the last two are of the exception principle type and would be made out only when there is something to report.

DEVELOPMENT OF BASIC DATA FOR CONTROL REPORTS

In making an industrial engineering approach to a department, one of the first things to do is to make a detailed survey of the departmental costs. This survey would include the analysis of the methods of wage payment and labor, material, and waste costs, and their distribution for a carefully selected period.

This period should be one that could be called typical and representative of the operating results in that department. The length of the period chosen depends primarily on the variables normally experienced in the department. It should be long enough to make certain that the picture obtained is truly representative. A month is usually chosen, and that is the recommended average period. The period should be selected and approved by the department head and the plant manager.

The data so obtained familiarize the analyst with the operating costs of the department. They serve as a basis on which to predetermine the effect of any proposed layout, equipment, or method change, or wage incentive installation. Later they become the basis to reflect the effect of any change made. Thus, they provide an accurate measuring stick of present labor, material, and waste costs against which to measure future progress in the operation of the department.

As these data are to be used later for comparative purposes, it is important that production and payroll records be available in proper detail. It is essential that the hours worked on each center or operation be distinct and the corresponding production be available by item. These things are necessary so that production standards can be applied to determine the relative effectiveness demonstrated during the pre-installation period. For example, it is not sufficient to know that during a certain 8-hour period so many man-hours were spent assembling four

thousand parts. It is also necessary to know the exact size and specifications of those parts.

If these data are inadequate or unavailable in existing records, it sometimes becomes necessary to institute the proper records during current periods in order to obtain the required information in the proper detail. The reasons for this step should be fully discussed with the department head. The step should also have the approval of the plant manager before it is taken.

Performance and Cost Reduction Report

General Comments. This report is designed to provide the plant manager and the department head with a comparative report showing overall progress made in effecting cost reductions within a department and the plant as a whole, as well as to provide useful operating data as a tool for control. (See Figure 12.) Each current pay period is compared with a carefully selected past pay period to determine the cost reduction effected in a particular department by all agencies working towards that end under the supervision or guidance of the department head. The report is not only for the current period, but for all periods to date.

Such a measuring stick must be based on a non-varying unit or it will lose its effectiveness as time passes, and as conditions such as hourly rates, specifications, and products change. The unit used in this report is *standard hours produced.*

Standard hours produced is defined as the amount of work that an average man, with average skill, experienced in the work in which he is engaged, can and should do in one hour without undue exertion. As can be seen, this amount of measured work will not vary regardless of changes in product, material, equipment, and the like. A standard hour represents so much measured effective work regardless of what it is expended upon. Thus, it makes an ideal measuring stick for long-term comparisons because a measured hour of work remains a measured hour of work, whereas other terms, such as unit costs, are directly affected by conditions, price, rate changes, and the like.

The management ratios shown on the report for control purposes are also expressed in hours as well as percentages, which makes them comparable over a long period of time.

Major Uses of the Report. As stated above, the report is designed primarily to measure overall cost reduction within a department, plant, or company, with standard hours produced the major unit of measure.

THE MANUFACTURING COMPANY

Plant No. 3

Copies To: Mr. Able
Mr. Smith
Mr. Jones
Mr. Brown

DEPARTMENTAL SEMI-MONTHLY PERFORMANCE AND COST REDUCTION REPORT

Department A Period Sept. 15, 1958

1. Pay Periods on Incentive Fifteen
2. Previous Highest Bonus Rating on a Volume Comparable to Volume This Period.
   A. Period 3-31-58 % Bonus 8.9 Volume 9743 Standard Hours
   B. This Period's Bonus Rating % Bonus 11.2 Volume 9886 Standard Hours

Preinstallation Comparisons	Description	Preinstallation	This Period	% Preinstallation
3. Incentive Work Only				
A. Total Chargeable Employees	Equivalent Full Time	250	140	56.
B. Total Chargeable Hours	Incentive Work Only	15696	8854	56.
C. Total Chargeable Earnings	Incentive Work Only	31392	19520	63.
D. Total Standard Hours Produced	Incentive Work Only	10800.87	9886	92.
E. Payroll Cost per Standard Hour	$3C \div 3D$	2.94	2.02	68.
F. Average Hourly Earnings	$3C \div 3B$	2.00	2.25	113.
G. Per Cent Bonus	$[(3D \times 100) \div 3B] - 100$	−31.1	11.2	162
4. Of Direct Labor, Indirect Labor, and Supervision				
A. Total Chargeable Hours Direct Labor		9243	5158	56.
B. Total Chargeable Hours Indirect Labor		10623	5308	50.
C. Direct Hours per Indirect Hour	$4A \div 4B$	.87	.97	111.
D. Total Supervision Hours	Standard Work Period	960	424	44.
E. Total Direct and Indirect Hours per Supervision Hour	$[(4A + 4B) \div 4D]$	21.	25.	119.

FIGURE 12

Preinstallation Comparisons	Description	Preinstallation	This Period	% Preinstallation
5. Of Incentive, Non-incentive, and Waiting Time Hours				
A. Total Chargeable Hours	Incen., Non-incen., Wait Time	19866	11157	56.
B. % Relationship Incentive Hours to Total Hours	$3B \div 5A$	79.0	79.4	101.
C. Total Chargeable Hours	Non-incentive Only	4170	1612	55.
D. % Relationship Non-incentive to Total Hours	$5C \div 5A$	21.0	14.5	98.
E. Total Waiting Time Hours		—	691	—
F. % Relationship Waiting Time Hours to Total Hours	$5E \div 5A$	—	6.2	—

6. Savings Effected This Period

A. Incentive Work Only

$$\frac{9886}{(\text{Production This Period in Standard Hours}—3D)} \times \frac{.92}{(\text{Difference between Preinstallation and This Period}—3E)} = \$9095$$

B. Non-incentive Work Only

$$\frac{4320}{(\text{Preinstallation Operating Basis})} - \frac{2892}{(\text{This Period Operating Basis})} = \$1428$$

7. Classification of Incentive Operators

20% and Over	Between 15 & 19%	Between 10 & 14%	Between 0 & 9%	Below 0%	Total
21	30	25	31	25	132

8. Excess This Period

A. Premium Time	$ 5
B. Average-Learner	6
C. Non-Std. Op.	139
Total	$ 151

9. Departmental Financial Results

Gross Savings Effected

Previously Reported	This Period	To Date
$ 125,296	$ 10,523	$ 135,819

Approved John W. Able
Plant Manager

FIGURE 12 (Continued)

The report will not be made effective until such a time as measured standards are placed on a sufficient number of operations to warrant making out the report.

Nevertheless, the report is designed so that it can be used to good advantage to measure progress being made up to the time that measured standards are placed on the operations. The method of making the comparison with each current period is covered in detail later on in this chapter. For the purpose of illustrating the use of the report previous to the establishment of measured standards, let us assume certain conditions.

The major cost reduction program in a given department, as planned, consists of four distinct phases. They are:

Changes in specifications, or simplification in the design of the product.

Changes in layout of department to reduce handling and other labor and delays.

Installation of improved equipment and methods.

Wage incentive installation.

Again, let us assume that each phase would be relatively distinct from the others, and the department head wishes to measure the contribution each phase made to the overall results.

This knowledge would be of value in determining whether or not the actual cost reduction realized from each phase of the program approached the estimates made. It might be of further value in weighing the probable results of the next phase of the program in view of the results obtained by the completed phases. This measurement of results obtained would be accomplished by selecting a current period at the end of each phase of the program and calculating a new set of preinstallation data based on the cost of performing the work under the new conditions. Thus, comparisons can be made not only against the original basic and permanent preinstallation or reference period, but also with the secondary periods representing production costs at the conclusion of each phase.

Another simpler and perhaps more desirable use of the report prior to the establishment of measured standards would be in a situation such as the following:

The department head wishes to inaugurate or continue a program of general cost reduction in his department. It is not possible for the industrial engineers to devote sufficient time to that department to develop measured standards for a period of time, yet he wishes

to measure the progress being made in the meantime. This can be accomplished, as explained above, by calculating the report on a non-measured or non-incentive basis, not by phases but on the whole. Thus the department head is provided with a measuring stick of the progress he is making in reducing costs, even though his department is not on measured standards.

KEY INFORMATION SHOWN ON REPORT. The attempt has been made to keep the report as simple as possible and yet provide valuable controls for the operation of the department. Of the information shown on the report, eight factors could be considered as furnishing the major or key controls. (See Figure 12.) They are:

1. Payroll cost per standard hour (3E)
2. Average hourly earnings (3F)
3. Per cent bonus (3G)
4. Direct hours per indirect hour (4C)
5. Total direct and indirect hours per supervision hour (4E)
6. Per cent relationship incentive hours to total hours (5B)
7. Per cent relationship waiting time hours to total hours (5F)
8. Operators below 0 per cent bonus (7)

CALCULATION OF DEPARTMENTAL REPORT. Once the report has been instituted by the industrial engineers with the aid of the plant accounting department, it becomes a function of the plant accounting department to calculate the report at the end of each pay period, and send copies to the following individuals:

1. Plant manager.
2. Vice president in charge of operations.
3. Director of industrial engineering.
4. Plant chief industrial engineer.
5. Department head.

The department head's copy need not show sections 6 and 9, which deal with the financial results obtained. The plant chief industrial engineer will see to it that the department head is kept informed of these results.

PLANT SUMMARY REPORT. In those plants which have departmental reports in two or more departments, it is of value to the plant manager to have a plant summary report prepared showing the progress being made in the plant as a whole. Copies of this report are sent to the same individuals as receive the departmental reports with the exception of the department heads. (See Figure 13.)

THE MANUFACTURING COMPANY

Plant No. 3

Copies To: Mr. Jones
Mr. Able
Mr. Brown
Mr. Magee

SEMI-MONTHLY PERFORMANCE AND COST REDUCTION REPORT
SUMMARY ALL DEPARTMENTS

1. Pay Periods on Incentive Twenty-two Period Ending Sept. 15, 1958
2. Previous Highest Bonus Rating on a Volume Comparable to the Volume This Period.
   A. Period 6-30-58 Bonus Rating 14.8 Volume _____ Standard Hours
   B. This Period's Bonus Rating 14.6 Volume _____ Standard Hours

Preinstallation Comparisons	Description	Preinstallation	This Period	% Preinstallation
3. Incentive Work Only				
A. Total Chargeable Employees	Equivalent Full Time	530	430	81
B. Total Chargeable Hours	Incentive Work Only	30784	20752	67
C. Total Chargeable Earnings	Incentive Work Only	55408	41588	75
D. Total Standard Hours Produced	Incentive Work Only	21302	22682	106
E. Payroll Cost per Standard Hour	$3C \div 3D$	2.60	1.83	70
F. Average Hourly Earnings	$3C \div 3B$	1.80	2.02	111
G. Per Cent Bonus	$[(3D \times 100) \div 3B] - 100$	−30 8	9.3	158
4. Of Direct Labor, Indirect Labor, and Supervision				
A. Total Chargeable Hours Direct Labor		20206	17234	85
B. Total Chargeable Hours Indirect Labor		21264	17103	80
C. Direct Hours per Indirect Hours	$4A \div 4B$	.95	1.01	106
D. Total Supervision Hours	Standard Work Period	2000	960	48
E. Total Direct and Indirect Hours per Supervision Hour	$[(4A + 4B) \div 4D]$	20.7	35.8	172

FIGURE 13

Preinstallation Comparisons	Description	Preinstallation	This Period	% Preinstallation
5. Of Incentive, Non-incentive, and Waiting Time Hours				
A. Total Chargeable Hours	Incen., Non-incen., WaitTime	41470	34420	83
B. % Relationship Incentive Hours to Total Hours	$3B \div 5A$	74.0	60.3	81
C. Total Chargeable Hours—Non-incentive Only		10686	13418	127
D. % Relationship Non-incentive to Total Hours	$5C \div 5A$	26.0	38.9	149
E. Total Waiting Time Hours		–	249	–
F. % Relationship Waiting Time Hours to Total Hours	$5E \div 5A$	–	.8	–

6. Excess This Period

A. Premium Time—	8
B. Average—Learner	7
C. Non-standard Operations	139
D. Total	154

7. Payroll Savings Effected This Period

A. Total of Departmental Savings This Period—	$17,465
B. Less Clerical and Other Expense Required to Operate System—	1,052
C. Net Payroll Savings Effected This Period—	$16,413

8. Total Financial Results to Date

Net Plant Savings

Previously Reported	This Period	Total to Date
$ 302,000	$ 16,400	$ 318,400

Approved John W. Able
Plant Manager

FIGURE 13 (Continued)

DESCRIPTIVE SUMMARY OF FIGURE 12

SEMI-MONTHLY PERFORMANCE AND COST REDUCTION REPORT

DEPARTMENT. The name of the department covered by the report.

PERIOD. The report is prepared at the end of each regular pay period, the date shown being the last day of the pay period covered.

1. Pay Periods on Incentive

The total number of pay periods the department has been on incentive, including the one covered by the report.

2. Previous Highest Bonus Rating on a Volume Comparable to the Volume of the Current Period

(A) Period. The date of the period that had the comparable total standard hours.

Per Cent Bonus. The percentage of bonus earned that comparable period.

Volume—Standard Hours. The total standard hours produced that period.

(B) The same information as shown in *A* for the current period.

3. Preinstallation Comparisons—Incentive Work Only

(A) Total Chargeable Employees includes all employees in the department, both incentive and non-incentive, exclusive of supervision and clerical. The number of employees is expressed as equivalent full time and is calculated by dividing total hours worked (all hours) by the standard number of hours per period. The nearest whole number is taken.

(B) Total Chargeable Hours includes all hours spent on incentive work, regardless of degree of bonus participation. This includes any supervision working on direct or indirect measured standards.

(C) Total Chargeable Earnings includes all wages and bonus paid all incentive workers for the hours worked under 3*B*, regardless of degree of bonus participation. All Premium Time is excluded.

(D) Total Standard Hours Produced includes all hours used as the basis for calculating bonus. Where a direct incentive worker participates indirectly on the average of a group or groups, his standard hours are charged into the total on the basis of his bonus calculations and on the basis of a full share, regardless of his actual participating share.

(E) Payroll Cost per Standard Hour is calculated by dividing the total chargeable earnings by the total standard hours produced.

(F) Average Hourly Earnings is calculated by dividing the total chargeable earnings by the total chargeable hours.

(G) Per Cent Bonus is calculated by multiplying the total standard hours by 100 and dividing that figure by the total chargeable hours and from that quotient subtracting 100, the difference being a plus or minus percentage.

4. Preinstallation Comparisons of Direct and Indirect Labor and Supervision

(A) Total Chargeable Hours Direct Labor includes all hours spent on direct labor, both incentive and non-incentive. This includes any supervision hours on direct labor classed under 3*B*.

(B) Total Chargeable Hours Indirect Labor includes all hours spent on indirect labor, both incentive and non-incentive. This includes any supervision hours on indirect labor under 3*B*.

(C) Direct Hours per Indirect Hour is calculated by dividing the total number of direct labor hours by the total number of indirect hours.

(D) Total Supervision Hours is the total number of all hours spent on supervision, based on the actual number of supervision hours worked by hourly supervision plus the number of standard hours per pay period for each salaried supervisor. In the event that a supervisor's time is shared with other departments, the normal fractional part of his time chargeable to each department is used. This figure also includes all clerical hours.

(E) Total Direct and Indirect Hours per Supervision Hour is obtained by adding the total chargeable hours direct labor (4*A*) and the total chargeable hours indirect labor (4*B*) and then dividing the sum of these two by the total supervision hours (4*D*).

5. Preinstallation Comparisons of Incentive, Non-incentive, and Waiting Time Hours

(A) Total Chargeable Hours includes all hours spent on incentive, non-incentive, and waiting time, exclusive of supervision.

(B) Per Cent Relationship Incentive Hours to Total Hours is calculated by dividing the total chargeable incentive hours (3*B*) by the total chargeable hours (5*A*).

(C) Total Chargeable Hours—Non-incentive Only—is the total of all hours spent on work not covered by standards, both direct and indirect, with the exception of supervision and waiting time hours.

(D) Per Cent Relationship Non-incentive to Total Hours is calculated by dividing the total chargeable hours—non-incentive only (*5C*) —by the total chargeable hours (*5A*).

(E) Total Waiting Time Hours includes all hours lost for any reason that are shown separately and excluded from incentive or non-incentive hours. Supervision hours are not considered.

(F) Per Cent Relationship Waiting Time Hours to Total Hours is calculated by dividing the total waiting hours (*5E*) by the total chargeable hours (*5A*).

6. Savings Effected This Period

(A) Incentive Work Only is calculated by multiplying the difference in payroll cost per standard hour between the preinstallation period and the current period by the total number of standards hours produced during the current period.

(B) Non-incentive Work Only is calculated by subtracting the actual operating labor costs for this period for this class of work from the calculated labor costs for the same work developed on the basis of labor costs shown on the wage incentive survey during the pre-installation period for this work.

As work classed as non-incentive is placed on incentive, the results obtained on that work will then be shown under "*A*—Incentive Work Only." As the department approaches its maximum incentive coverage, the work shown under *B* will be a steadily diminishing amount and that under *A* a steadily increasing amount.

7. Classification of Incentive Operators

This shows the number of incentive operators falling in each designated group.

8. Excess This Period

(A) Premium Time includes all money paid as overtime or holiday premium in the department for the pay period.

(B) Average-Learner includes all money paid out under the average earnings rating scale and the learner's compensation allowance.

(C) Other—all other excess moneys paid should be shown separately.

(D) Total—shows total of all money paid out as excess over regular pay.

9. Department's Financial Result—Gross Savings Effected

Under "Previously Reported" is shown the cumulative total of savings effected in the department to date. Under "This Period" is

shown the total savings effected this pay period. This figure is taken to the nearest dollar. Under "To Date" is shown the total "Previously Reported" plus the total "This Period." The "Previously Reported" and "To Date" figures will start at zero on January the first of each year, regardless of the length of time the report has been in effect.

Descriptive Summary of Figure 13

COMBINED PERFORMANCE AND COST REDUCTION REPORT—ALL INCENTIVE DEPARTMENTS

1. The Data Shown on This Report

These data are the combined figures taken from the individual department reports.

Sections 1, 2, 3, 4, and 5 are handled in the same manner as the correspondingly numbered sections in the departmental performance and cost reduction report.

Section 6 in the combined report corresponds to section 8 in the departmental report.

2. Section 7—Payroll Savings Effected This Period

(A) Total of Departmental Savings This Period is the sum of all gross savings reported on the individual departmental reports (Figure 12).

(B) Less Clerical and Other Expenses Required to Operate System. Under this heading is placed the total clerical and miscellaneous expense added directly as a result of the operation of the incentive system.

(C) Net Payroll Savings Effected This Period is the total savings effected by all departments after the total operating expense (*B*) has been deducted from the total gross savings (*A*).

3. Section 8—Total Financial Results to Date

This section is the total result of all departments' results and corresponds to section 9 of the departmental results. This section also starts at zero on January the first of each year.

Record of Hours Worked and Bonus Earned

Daily Report. Departmental daily record of hours worked and bonus earned report (Figure 13) for each department on incentive

is made out before noon of the following work day by the accounting department. Ordinarily the industrial engineers prepare the first reports and, after simplified routines are worked out, turn the preparation of the reports over to the accounting department.

The purpose of this report is to show the bonus earnings today and to date for each productive employee working under the incentive plan, and to furnish the employees and the supervisor of the department with a classification of hours worked, such as incentive, non-incentive, waiting time, and the like. This report thus provides a direct control tool for low bonus efficiencies, waiting time, and non-incentive work.

This report is prepared for the supervisor of the department and the plant chief industrial engineer. The supervisor's copy is posted in a central location in the department so that each employee may see how much bonus he earned.

Pay Period Summary Record of Hours Worked and Bonus Earned. Pay period summary record of hours worked and bonus earned report for each department on incentive is made out on the second day following the end of the pay period by the accounting department, using the same form as shown in Figure 14. The purpose of this report is to summarize percentage of bonus, bonus hours earned, and a classification of hours for each individual and totals for the department for the entire pay period.

The report is prepared by the accounting department for the plant manager and supervisor of the department, with copies for the plant chief industrial engineer and the general industrial engineering division. A copy is also prepared for the payroll department to authorize the payment of bonus. The departmental supervisor's copy should be posted in the department in order to notify each employee of the bonus hours and per cent he earned that pay period.

Combined Use of Bonus Hours Earned Report for Budget Purposes. In those departments having incentive systems, the bonus hours earned report can serve as a dual control covering the daily report of budget performance in addition to the regular bonus performance. Since bonus standards are used as budget rates in incentive departments, some duplication and work can be eliminated without sacrificing control over costs by combining the daily budget report with the record of hours worked and bonus earned report.

When wishing to use the combined report, a column can be added to the right (see Figure 14) of the total hours column for the budget allowances. On the theory that incentive operations are controlled because they are on bonus, no budget allowances are calculated daily for that work. An exception to this could be where a large amount

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RECORD OF HOURS WORKED AND BONUS EARNED

PLANT_____ DEPARTMENT_____ DATE_____

DEPARTMENTAL UNIT

Name — Group — Gang	Bonus Hours Earned		% Bonus Earned		Hours					
	To-day	To Date	To-day	To Date	Incentive	Non-Incentive	Waiting	Supervision and Inspection	Total Hours	Budget
Total Charges Excluding Incentive Hours										
Totals										
Per Cent of Total Hours										

FIGURE 14

of non-incentive and waiting time is interspersed with the incentive work. Then the non-incentive work and waiting time could be lumped together and a budget allowance determined for the total. On all classes of labor not covered by incentives, daily budget allowances are calculated and shown by class in the standard manner. No overs or unders are calculated or shown. Semi-monthly, a complete summary budget report for the period would be prepared in the usual manner.

Descriptive Summary of Figure 14

RECORD OF HOURS WORKED AND BONUS EARNED

1. Plant Number. The number or name of plant covered by the report.

2. Department. The name of the department covered by the report.

3. Date. The date of the performance.

4. Departmental Unit of Measure. The name of the departmental unit of measure.

5. Name, Group, Gang. The name of the operation, type of labor or employee, the number or name of the group or gang.

6. Bonus Hours Earned (Today). The bonus hours earned for the day's performance.

7. Bonus Hours Earned (to Date). The bonus hours earned for the day's performance, plus the bonus hours earned for previous performance in the pay period.

8. Per Cent Bonus Earned (Today). The bonus hours earned divided by the incentive hours worked for the day's performance.

9. Per Cent Bonus Earned (to Date). The bonus hours earned to date divided by the incentive hours to date.

10. Incentive Hours. The number of hours spent by the employee or group on work measured by time standards (today only).

11. Non-incentive Hours. The number of hours spent by the employee or group on work that is not measured by time standards (today only).

12. Waiting Hours. The number of hours spent in waiting (today only).

13. Supervision and Inspection. The number of hours spent for all supervision and inspection (today only).

14. Total Hours. Total number of hours for incentive, non-incentive, waiting, supervision, and inspection (today only).

15. Budget Hours. The budget hours for all work not covered by incentives. No budget hours need be applied against machines or groups where portions of work are on both incentive and non-incentive. The supervisor can use per cent bonus, waiting time, and non-incentive as the daily controls for incentive work, since these items indicate whether or not the budget is being met.

16. Total Charges (Hours) Excluding Incentive Hours. The total of all hours excluding incentive work.

17. Totals. The totals of bonus hours and per cent bonus earned today and to date, and totals of the different classifications of hours.

18. Percentage of Total Hours. The percentage of total hours for each classification of hours worked.

Excess and Waiting Time Reports (General)

PLANT DEPARTMENTAL EXCESS AND WAITING TIME REPORT. The departmental excess and waiting time report (Figure 15) for each plant showing departments on incentive only is made out at the end of each pay period by the accounting department. The industrial engineers prepare the first reports and, after simplified routines are worked out, turn the preparation of the reports over to the accounting department. The purposes of this report are to show a comparison of departments on each major type of waiting time and to report the total man-hours of waiting time for the plant, attempting to provide the plant manager with a tool for control over lost time. This report is prepared for the plant manager, with copies for the director of industrial engineering, the plant chief industrial engineer, and all departmental foremen.

DESCRIPTIVE SUMMARY OF FIGURE 15

SEMI-MONTHLY PLANT DEPARTMENTAL EXCESS AND WAITING TIME REPORT

1. Plant Number. The number of the plant covered by the report.

2. Location. The location of the plant covered by the report.

3. Period Ending. The report is prepared at the end of each regular pay period, the date shown being the last day of the pay period covered.

4. Department Number. The number of the department covered by the report. The name of the department should be placed in the space beneath department number.

Copies to: Plant Manager
Director Industrial Engineering
Department Foreman
Plant Chief Industrial Engineer

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DEPARTMENTAL EXCESS AND WAITING TIME REPORT
(Departments on measured standards only)

Plant No._____

Location_____ Period Ending_____

Delay Code	Classification of Delays	Dept. No.____ Total Man-Hours	Dept. No.____ Total Man-Hours	Dept. No.____ Total Man-Hours	Dept. No.____ Total Man-Hours	Dept. No.____ Total Man-Hours	Dept. No.____ Total Man-Hours	Dept. No.____ Total Man-Hours	Total All Depts. Total Man-Hours
700–1	Mach. Breakdown								
700–2–1	Wait for Basic Stock								
700–2–2	Wait for Mat'l or Supplies								
700–3	Wait for Instructions								
700–4	No Work (Scheduling)								
700–5	Power Failure								
700–6	Dispensary Time								
700–7	Wait for Trucks								
700–8	Recond. Mat'l								
700–9	Mach. Equip. Trouble								
	TOTAL WAITING TIME								
	% WAITING TIME EFFICIENCY								
56	Non-standard jobs								
57	Samples or Exper.								
	TOTAL SPECIAL								
750	Excess (General)								
750–1	Excess Non-std. Method								
750–2	Excess Non-std. Equip't								
750–3	Excess Non-std. Material								
	TOTAL EXCESS								
	% SPOILAGE								

FIGURE 15

5. Delay Code. The code number for the different classifications of delay time. This number aids in observing quickly or accumulating any desired classification of delay.

6. Classification of Delays. The classification of delays is primarily a classification of delays by the cause of the delay. Space is available for any additional classifications.

7. Total Man-hours. The total man-hours of delay in each department by the classification of the delay. These hours are accumulated from the reports of production on each machine or operation prepared in each department on incentive.

8. Total Man-hours (All Departments). The total man-hours delay is obtained by adding the delays opposite each classification for all departments shown.

9. Total Waiting Time. The total waiting time for all classifications of delays by departments and also for all departments.

10. Per Cent Waiting Time. Total waiting time hours divided by the total of all hours operated, incentive, non-incentive, and waiting, excluding supervision and clerical, gives the per cent waiting time total. This is calculated for each department on incentives and also for the total of all departments.

11. Samples or Experimental. The time spent in running samples or experimental jobs, incentive or non-incentive.

12. Non-standard Jobs. The time spent on regular production equipment for the operation of jobs usually covered by incentives but for which the standards do not accurately measure the work being done. This will exclude sample and experimental time.

13. Total Special. The total time for all classifications of special jobs by departments and also for all departments.

14. Excess General. The total excess time spent on jobs in each department classified as excess, that is, of a general nature.

15. Excess Non-standard Methods. The total excess time spent on jobs in each department classified as excess time due to operating under non-standard methods.

16. Excess Non-standard Equipment. The total excess time spent on jobs in each department classified as excess time due to operating non-standard equipment, such as group drives when individual drives are more economical.

17. Excess Non-standard Material. The total excess time spent in manufacturing a product from non-standard materials.

18. Total Excess. The total of all classifications of excess time for each department and for all departments.

19. Per Cent Spoilage. The total pieces spoiled divided by the good pieces produced plus spoilage gives the per cent spoilage. This is calculated by departments and for all departments.

Excess Cost Reports (General)

A departmental semi-monthly report of excess cost (Figure 16) for each department on incentive is made out at the end of each pay period by the accounting department. The industrial engineers prepare the first reports and, after simplified routines are worked out, turn the preparation of the report over to the accounting department.

The purposes of this report are to show the excess cost of manufacturing because of operating at non-standard speed or use of non-standard equipment, material, or methods, and as accurately as possible to compare these excess costs with the estimated amount of money required to eliminate the cause of the excess allowances. This report is prepared for the plant manager, director of industrial engineering, the plant chief industrial engineer, and the departmental foremen. When such excess is negligible or non-existent, the report need not be made out until such time as excess costs once again appear.

Descriptive Summary of Figure 16

DEPARTMENTAL SUMMARY—REPORT OF EXCESS COST

1. Department. The name of the department in which the report is prepared.

2. Plant Number. The number or name of the plant covered by the report.

3. Location. The location of the plant covered by the report.

4. Period Ending. The report is prepared at the end of each regular pay period, the date shown being the last day of the pay period.

5. Classification of Excess Costs by Causes. The classification of excess is primarily a classification of excess standard allowances by the chief causes for the excess. Space is provided for any additional classifications.

6. Total Excess to Date. The total cost of the man-hours of excess accumulated to date by causes of excess allowance.

7. Estimated Cost to Remove Cause of Excess. The estimated cost to remove the cause of the excess if it has been determined for each

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Director Industrial Engineering
Department Foreman
Plant Chief Industrial Engineer

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Report of Excess Cost

(Departments on measured standards only)

(Excess is additional measured time required for non-standard equipment, methods, materials)

Department_____
Plant No._____
Location_____

Period Ending_____

Classification of Excess Cost by Causes	Total Excess To Date	Est. Cost to Remove Cause of Excess	Date Excess Began	This Period		
				Hours Excess	Cost of Excess	Est. Cost to Remove Cause of Excess
Non-std. Equip. (Loading Devices)						
Non-std. Equip. (Unloading Devices)						
Non-std. Equip. (Driving Mechanism)						
Non-std. Equip. (Producing Machine)						
Non-std. Mat'l (Purchased)						
Non-std. Mat'l (Prepared by Selves)						
Climatic Conditions						
Customers Special Service Requests						
Non-standard Layout						
Non-standard Methods or Crews						
Miscellaneous						
TOTAL						
% EXCESS EFFICIENCY						

Note: % Excess efficiency is total hours excess divided by standard hours produced.

Recommendations for elimination of excess _____

FIGURE 16

operation needing excess allowance is placed opposite each cause. This is also a "to date" figure.

8. Date Excess Began. The date on which the excess began to occur on any operation for the cause specified.

9. Hours Excess (This Period). The total man-hours of excess for the semi-monthly period by cause of excess allowances.

10. Cost of Excess (This Period). The total cost of the man-hours of excess for the semi-monthly period by the cause of excess allowance.

11. Estimated Cost to Remove Cause of Excess (This Period). The estimated cost to remove the cause of excess is determined on each operation requiring excess allowances and placed opposite each cause for the excess occurring during this period.

12. Total (Excess to Date)—All Causes. The total cost of the man-hours of excess accumulated to date for all causes of excess allowance.

13. Total (Estimated Cost to Remove Cause of Excess). The total estimated cost for removing all causes of excess.

14. Total (Hours Excess—This Period). The total man-hours of excess for all causes.

15. Total (Cost of Excess—This Period). The total cost of the man-hours of excess for all causes.

16. Total (Estimated Cost to Remove Cause of Excess—This Period). The total estimated cost of removing all causes of excess allowed during this period.

17. Per Cent Excess Efficiency of Total Standard Hours Produced. The total man-hours excess divided by total standard hours produced by the department.

18. Recommendations for Elimination of Excess. A brief description of the recommendations for elimination of major items of excess.

SUMMARY EXCESS AND WAITING TIME REPORTS BY PLANTS

In multiplant companies it may be found desirable to prepare a comparative report on the excess and waiting time by plants (Figure 17). This report is prepared by the general industrial engineering division and the information is taken from the plant departmental excess and waiting time reports (Figure 15). The last column on this plant report gives the total for that plant, and this figure is the one shown on the summary report for all plants. Copies of this report are given the vice president of operations, the plant managers, the director of industrial engineering, and the plant chief industrial engineer.

Because budgets and other forms of cost control are designed for the same purpose, there is bound to be some overlapping and duplica-

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Plant Managers
Director of Industrial Engineering
Plant Chief Industrial Engineers

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Summary Excess and Waiting Time Reports by Plants
(Departments on measured standards only)

Period Ending_____

Delay Code	Classification of Delays	Plant No.____ Total Man-Hours	Plant No.____ Total Man-Hours	Plant No.____ Total Man-Hours	Plant No.____ Total Man-Hours	Plant No.____ Total Man-Hours	Plant No.____ Total Man-Hours	Plant No.____ Total Man-Hours	Total all Plants Total Man-Hours
700–1	Mach. Breakdown								
700–2–1	Wait for Basic Stock								
700–2–2	Wait for Mat'l or Supplies								
700–3	Wait for Instructions								
700–4	No Work (Scheduling)								
700–5	Power Failure								
700–6	Dispensary Time								
700–7	Wait for Trucks								
700–8	Recond. Mat'l								
700–9	Mach. Equip. Trouble								
	TOTAL WAITING TIME								
	% WAITING TIME EFFICIENCY								
56	Non-standard Jobs								
57	Samples or Exper.								
	TOTAL SPECIAL								
750	Excess (General)								
750–1	Excess Non-std. Method								
750–2	Excess Non-std. Equip't								
750–3	Excess Non-std. Material								
	TOTAL EXCESS								
	% SPOILAGE								

FIGURE 17

tion unless this matter of control is viewed as an overall picture. In departments where an incentive installation has been made, the daily bonus report can also serve as the daily budget report. When the operators on incentive are earning bonus they should also be meeting or beating the labor budget. The budget allowances for those operations or classes of labor not on incentive and the results obtained can be incorporated on the same bonus report form, in a special column provided for that purpose. (See Figure 14.) Under such a set-up the preparation of the regular budget reports can be confined to weekly and monthly reports. Where the incentive installation is particularly complete and positive the formal budget report may be issued on a monthly basis only.

The important point in this matter of developing controls for the use and guidance of the department head is that we should bend every effort to keep them as simple and positive as we can. Thus the engineer in charge must consider and combine all sources of control data and information to gain that end. He should keep the controls which are set up flexible and properly maintained, so that he can always take full advantage of new developments that will improve the nature and effectiveness of those controls.

CHAPTER SIXTEEN

Evaluating and Revising Incentive Plans

There has been a tendency among some managements to continue an incentive plan long after its usefulness has been dissipated through improper maintenance, improper design, or other causes. Many times this occurs through lack of clear-cut objectives, insufficient factual information as to the status of the program, and/or the unwillingness to tackle an unpleasant assignment. Sound management will establish a program to sense in advance this eventuality and meet it when it occurs. The existence of a continuing evaluation program may provide the necessary stimulus to the organization to keep the system from deteriorating. Such a program would involve the establishment of definite criteria against which to base the measurement of the success of the installation. It would provide indicators for evaluating these criteria, and would also provide guidance for taking whatever steps appear necessary in order to correct any flagrant deterioration.

The criteria for a successful wage incentive system are simply stated. As a management technique it should contribute to the long-range benefit of the total organization. This requires that it contribute to lower costs. These may be reflected directly in increased profit or indirectly into increased profit from greater volume obtained through lower prices. It must also provide for increased earnings of the employees so that they can share in this ever-increasing productivity.

COST AS A MEASURE OF THE EFFECTIVENESS OF AN INCENTIVE SYSTEM

The type of cost control reports suggested in the previous chapter provides a good point of beginning for the determination of the effectiveness of the incentive system. These reports provide immediate information as to the relative effectiveness of the performance and earnings compared with those of a given reference period. Other indicators are necessary, however, in order to obtain a complete evaluation.

In a dynamic economy such as ours, it is not sufficient to know how we are performing relative to some previous period. It is also necessary to know that we are continuing to progress. Since overall continuing progress may come relatively slowly, it is probably helpful to attempt an overall review of the total wage incentive system no oftener than annually. For a review of this sort we can prepare a summary evaluation similar to the one shown in Figure 18. In order to indicate the sources of information and indicate the type of consideration to be given each factor, each item on this figure will be considered separately in the following discussion.

1. Routine Maintenance Cost

This should include the actual costs of maintaining the standards, auditing methods, etc. It should include the portion of the industrial engineering department costs that can logically be charged to this type of work. It may also include a portion of the cost of the supervisory staff. In the case of industrial engineering department costs it should be a relatively simple matter to secure this cost breakdown. Most modern industrial engineering departments have some form of time reporting either on a periodic or sampling basis which will provide reliable information. With the use of work sampling procedures similar reliable information can be economically provided as to the distribution of supervisory time. Considerable discretion must be used in the evaluation of this information, since this much or more of the supervisor's time might be spent in "policing" activities if the incentive were not in operation.

The total amount should be expected to rise as incentive coverage is increased, stabilize as saturation is reached, only to increase again as new cost reduction programs are installed. By the use of standard data and other improved techniques this amount can usually be reduced if it is a significant cost.

INCENTIVE EVALUATION

Summary Plant No. 3

COSTS AND SAVINGS	1953	1954	1955	1956	1957	1958
1. Routine Maintenance Cost	$ 15,000	$ 16,000	$ 16,500	$ 22,000	$ 18,000	$ 20,000
2. Clerical Costs	6,000	6,600	7,200	8,000	9,000	10,000
3. Grievance Costs	30,000	7,000	7,600	26,000	18,000	6,000
4. TOTAL COSTS	$ 51,000	$ 29,600	$ 31,300	$ 56,000	$ 45,000	$ 36,000
5. Gross Savings	125,000	100,000	135,000	148,000	151,000	137,000
6. INDICATED NET SAVINGS	$ 74,000	$ 70,400	$103,700	$ 92,000	$106,000	$101,000
7. Productivity per Man-hour	110	111	112	118	122	125
EARNINGS AND OTHER FACTORS						
8. Bonus Earnings	20%	28%	30%	24%	28%	32%
9. Incentive Coverage	75%	85%	95%	84%	95%	96%
10. Base Rates Index (Community)	101	100	105	102	105	105
11. Base Rates Index (Industry)	100	97	98	96	100	99
12. Number of Incentive Grievances	52	16	15	38	42	16
13. Number of Suggestions Accepted	26	36	46	10	11	26
14. Evidence of Controlled Earnings	no	no	yes	yes	no	no

FIGURE 18

2. Clerical Cost

This can be obtained directly from the performance and cost reduction report. Such costs have in the past been of great concern in some plants. A substantial amount of clerical cost is an indication that some new methods should be considered. With the use of mass data handling machinery, it may be possible to reduce these costs drastically.

3. Grievance Costs

Although the total composite cost of any grievance is not directly measurable, certain of its aspects are. The grievance cost might well include any employee time paid for by the company while bargaining or processing grievances. It should also include an estimate of the cost of the management's lost time while bargaining and preparing to bargain, and any arbitrator or legal fees incurred. It should be noted

and expected that these costs will be highly variable over a period of time. It should further be recognized that the institution or reactivation of a cost reduction program will conceivably result in an increased number of grievances for handling. Of course, if these costs continue to be excessive over a period of time and the indications are that excessive costs are likely to continue, it is a sign of a need for drastic revision or perhaps elimination of the incentive plan.

4. Total Costs

These are simply the sum of the first three items.

5. Gross Savings

This figure is taken directly from the performance and cost reduction report and indicates the relative performance of the plant compared with a representative period of non-incentive operation prior to the installation of the current incentive plan. This figure is sometimes questioned since it may be claimed that some of the cost reduction shown here would have been obtained over a period of time through a methods improvement program without the institution of a wage incentive plan. To some extent this may be true; however, if this figure is considered together with the Productivity per Man-hour (Item 7) it may then be correctly interpreted. If the productivity per man-hour continues over a period of time to rise at a rate in excess of 2 per cent per year it is likely that we are receiving the amount of savings from the original plan that is indicated by the measure of the differences indicated.

Some companies, however, have determined through considerable experience that the increased productivity which is sustained through the use of incentives will amount, on the average, to approximately 30 per cent. Therefore, they limit the amount of savings shown for the purposes of this type of evaluation to a maximum of 30 per cent of the payroll.

6. Net Savings

This figure is obtained by subtracting the administrative expense from the Gross Savings (Item 4 minus Item 5).

7. Productivity per Man-hour

This figure is an index of the effectiveness of organization as a whole. In the case of a malleable iron foundry this index was calculated as follows:

$$\text{Productivity per man-hour} = \frac{\text{Pounds of good castings produced}}{\text{Total man-hours worked}}$$

In many other instances, meaningful ratios may be much more difficult to establish. If they can be provided they are extremely helpful.

In the example shown on Figure 18 the Productivity per Man-hour has continued to rise throughout the extent of the operation of the incentive plan at a rate of approximately 3 per cent per year. This would indicate a normal rate of improvement and, therefore, the implication would be that this incentive installation is not inhibiting progress to any undue extent. A sobering note is provided when it is noted that the average performance of incentive workers has, as reflected in earnings (see Item 8), increased approximately 10 per cent during the period that productivity has increased 15 per cent. This indicates a net gain from methods improvement of about 1 per cent per year. This figure is hardly satisfactory. If the productivity per man-hour remains constant over an extended period of time, it means that the incentive system may be at least one of a series of conditions that are inhibiting progress. Its administration should then be viewed with a mind to drastic change.

EARNINGS AND OTHER FACTORS

As previously stated, it is important that the employee share in the increased productivity resulting from all technological improvements, including incentive plans. There are also other factors of a more or less tangible nature that should be considered in this evaluation of the operation of the incentive plan. These items will be considered singly or in groups, as their interpretation demands.

8. Bonus Earnings

This figure comes directly from the performance and cost reduction report, and is an expression of the average amount that the worker's pay is increased by the incentive.

9. Incentive Coverage

This figure is usually determined as the percentage of hours worked on incentive to the total hours on the hourly payroll. In order to determine the effect on all employees, it is necessary to combine the consideration of Item 8 with Item 9 since it is extremely important to know what percentage of the workers are benefiting from the incentives. The fact seems well established that for a successful operation the highest percentage coverage possible is a good objective. The percentages shown on this evaluation are very good and many

companies have indicated that approximately 95 per cent is an optimum point to reach in incentive coverage.

10. Base Rates Index (Community)

11. Base Rates Index (Industry)

To be sure that the bonus earnings figure cited above is truly representative of the gain to the individual employee, it is also necessary to evaluate the base rate structure as opposed to the community and industry indexes. These indexes are simply the ratio of the average of base rate for key jobs in our plant to those in other plants in the community and in the industry. It is obvious that in this particular company the employees are doing as well as other employees in the community and, by and large, in the industry, and that they are maintaining their position. This fact means that the bonus earnings themselves do represent a reasonably true index of the benefit of the incentive system to the individual employees.

12. Number of Incentive Grievances

This is expressed directly as the number of grievances occurring over wage incentive problems. If either the employment or incentive coverage varies substantially, it might be wise to express this as an index, such as the number of such grievances per hundred thousand man-hours worked. In addition to the amount of money involved in handling grievances, the number of grievances processed may be an additional indicator of the extent of acceptance.

13. Number of Suggestions Accepted

Some companies feel that the number of suggestions accepted is indicative of the amount of cooperation which may be given by the employees.

14. Evidence of Controlled Earnings

All companies operating incentive plans should plot the performance of their employees against standard, at least periodically. These graphical analyses sometimes indicate that the control of earnings is being exercised by the employees. This situation in itself should not alarm anyone. In fact, it is probable that in the most successful incentive installations a certain measure of control will exist. It is possible that most individuals when working against a performance standard on manual work will and should limit their productivity to some level at which they may choose to work, in other words, make

a bargain with themselves as to how much physical effort they will apply or can apply before they reach the point of diminishing returns in terms of fatigue.

Kilbridge has suggested that statistical measures of evaluation of the performance of an incentive plan should be considered. He reports as follows:

> The following conclusions seem warranted as a result of this chapter's investigations:
>
> 1. Some attempt should be made at measuring statistically the response to the incentive application. This response may be evaluated on a group, department, or plant-wide basis, depending upon the situation.
>
> 2. Frequency curves are perhaps the easiest and most reliable measures of effectiveness. They should be plotted with frequency in per cent or number of employees on the vertical axis and productivity on the horizontal.
>
> 3. The frequency curve depicting effective incentivation is noticeably skewed to the right. The mean productivity should exceed the mode of the curve, but there is no quantitative function available which associates the measure of response with the measure of skewness.
>
> 4. Restriction of output is indicated when the frequency curve drops off sharply at a point of high productivity.
>
> 5. The range of productive capacities of workers is different on different kinds of jobs. This basic difference of productivity ranges should be considered when interpreting the dispersion of frequency distribution.
>
> 6. Control charts similar to those employed in statistical quality control can also be used to measure the effectiveness of an incentive system. Their use is more difficult than plotting frequency curves and their interpretation is far more problematical.
>
> 7. Control charts are probably limited in use to situations which are technologically stable; that is, where a constant system of chance causes operates.
>
> 8. There seems to be a relationship between consistency of performance and effectiveness of incentives.
>
> 9. The effectiveness of an incentive application should be questioned when the ratio of the range of intra-individual differences is greater than the ratio of the range of inter-individual differences.
>
> 10. *Any statistical measure of effectiveness should be interpreted with great caution.*[1]

For those who are interested in more details of this approach, a summary of his study relative to the use of frequency distributions has been included in Appendix B.

In addition to the overall data appearing on the evaluation just discussed, there are other indications of trouble. In fact, before deterioration has progressed very far both management and workers may be well aware of the conditions. Unit labor costs may be out of

[1] Maurice D. Kilbridge, *The Management of Wage Incentives*, Ph.D. Dissertation, State University of Iowa, Iowa City, 1954, p. 238.

line—workers may be changing methods and running away with standards. Flagrant restriction of output may be practiced. Record juggling may be resorted to, to keep an appearance of stable earnings. Continual wrangling and unpleasantness may also evolve from such a situation.

REVISING A DEFECTIVE PLAN

Once it has been determined that an incentive plan is defective, management should be determined to take whatever steps, painful as they may be, that are necessary to correct it. This can be done,[2] but it usually is an extremely trying experience.

Although many changes may be needed, the standards themselves are usually most in need of correction. No hope for a successful revision can be entertained until these have been readjusted to an equitable basis.

As in the establishment of an incentive in the first place, the most important consideration is employee acceptance. Here again, management must be prepared to go to the worker, develop or maintain his respect and confidence, and gain his understanding of the need for revision.

Management must be prepared to make the transition period as painless as possible for the employee. Sometimes this is done by making "red circle" standards of the present standards. These "red circle" standards apply to present incumbents only and they usually apply only for a definite period of time, such as one year. Sometimes managements have felt it necessary to "buy" their way out of this difficulty. This they may do by paying a substantial lump sum in lieu of continuing present standards. Such payments may be made to each employee, to a group of employees, or to all employees. This is an open admission of management's responsibility, the action is clear-cut, and the issue is disposed of completely at one time. If one of these two alternatives is necessary, the "buy out" is probably preferable.

It is extremely important that both the employee and the union understand that the company must have technological progress if it is to remain competitive. They must also be assured and convinced that the objective of the revision is not to "cut rates" as a cost reduction measure but to eliminate inequities such as wild fluctuations in earnings

[2] John R. Listman, "We Tossed Out a Runaway Incentive Plan and Got a Good One," *Factory Management and Maintenance*, May 1950, pp. 112–113; H. L. Waddell and Robert S. Rice, "How to Revise an Incentive Plan—and Live Through It," *Factory Management and Maintenance*, January 1953, pp. 138–140.

and/or necessary effort. Once this understanding is accomplished, the revision is well on the way.

The pattern of procedure to be followed for a revision may well follow the pattern described in Chapter Six for the original installation. After management has allowed a system to deteriorate, its judgment is seldom as respected by the workers as it was when a new program was being initiated. For this reason, management must work hard, be sure of its ground, have definite fair objectives, and its staff *act* as managers in order to reclaim a deteriorated plan.

In some cases a wise management may decide to eliminate incentives entirely. Many unions will encourage it to do so. If an equitable rate schedule can be worked out and assurance made that productivity levels can be maintained, this could prove a wise decision. It is even possible that a way might be found for sufficiently improving cooperation that productivity might increase temporarily. The usual result of discontinuing a plan, however, is ultimately to return to a lower level of productivity.

In conclusion, then, it should be stated that management should be continually alert and informed as to the overall effect of its incentive plan. It must guard against the stagnating effects attributed to overstandardization. It must sense trouble in advance if possible, and meet it courageously when it comes. The successful revision of such a plan requires courage, foresight, understanding, and patience.

CONCLUSION

The treatment of the subject of wage incentives in this book has been a discussion involving proved methodology, procedures, and principles. Incentives have been successfully established and maintained over long periods of time when these fundamentals have been adhered to.

This does not mean that incentives cannot be successful if somewhat different procedures and methods are followed. The most important of the criteria for success would seem to be the incentive spirit. Incentives always can be successful when the incentive workers really want them to be successful. Much more of the fundamental nature of the subject needs to be discovered in this area. Only by experimentation, innovation, and a great deal of courage will the incentive-minded manager be able to develop the incentive spirit throughout his entire organization.

APPENDIX A

Arbitrators' Determination of Management's Right to Manage

by Walter L. Daykin, Ph.D.

Modern day management is interested in increasing production and in decreasing costs. This objective is obtained, according to some top executives, by the maintenance of uninterrupted production, by the development of generally satisfied employees, and by retaining to management the right to make managerial decisions and the power to enforce these decisions effectively. In other words, management wants the right to manage. This right to manage would include such items as the power to determine the financial policies and structure of the business, the determination of the managerial organization, the products to be produced, the price of the goods, the services to be rendered to the consumers by the company, and the sales policy including such factors as the market areas and the size of the inventory. Generally it is contended that the right to manage also grants to the employer the exclusive privilege to control and use the plant property, to determine the allocation and the structure of the plants including the plant layout, the equipment to be used, the techniques or methods of production, and the safety regulations, to determine such aspects of job content as the size of the working force, the assignment of workers, the amount of work to be done, and the maintenance of discipline.

RESEARCH SERIES 6, PUBLISHED BY THE BUREAU OF LABOR AND MANAGEMENT, STATE UNIVERSITY OF IOWA, IOWA CITY, 1954.

It is argued that such managerial authority arises out of ownership of the business enterprise and that, in the interests of the public, the above prerogatives and functions cannot be compromised. If business is to continue to be progressive and efficient, to create full employment and to raise the general scale of living, these managerial prerogatives must be maintained.

Until recent years the unions did not directly question management's exclusive power to function in such areas as the product to be produced, the financial policies of the company and the managerial organization. At present some powerful unions are demanding an equal voice in the determination of the price of the goods produced, the levels of production, the rate and nature of the capital investment, the rate and nature of technological changes, the size and the location of the plants, and the development and conservation of natural resources. *The union has for years been concerned about, and has often challenged, management's prerogatives relative to the determination of the techniques and methods of production, the job content, the discipline of employees and the allocation of the labor force.** While it is contended that certain rights are still the functions of the employer, management concedes that these activities affect the employees both directly and indirectly and are, therefore, subjects of collective bargaining. Management, in many cases, has been forced to take this point of view in order to effectively operate the enterprise.

This study is concerned with a brief analysis of the arbitrator's role in the determination of management's right to manage in such industrial areas as the allocation of the working force, the determination of production and operating methods, the arranging of the rates of pay and the methods of payment, the making and the enforcement of plant rules and the determination of the ability of employees. The decisions of the arbitrators are significant in that they reveal somewhat the prevailing attitude toward these problems and some of the outstanding trends in the field of labor and management.

GENERAL RIGHTS OF MANAGEMENT

In the area of arbitration many problems relative to managerial prerogatives have arisen. An analysis of the decisions of the arbitrators reveals that in general, when management bargains with the union and signs a collective bargaining agreement his original authority and power to conduct his business operations is modified only to the extent

* Italics ours.

that the employer voluntarily and specifically relinquishes such power and authority. This indicates that the rights of management are of a residual nature, that is, all rights possessed by the employer before the collective bargaining contract are retained by the employer except those modified by the agreement. *In fact, it has been established that in the absence of contractual limitations, management has the unrestricted or the absolute right to manage. This includes the right to make rules, set hours, assign work, and to determine the conditions of employment.*[1] *The union's argument that management only retains such power, authority or rights as are listed in the contract is rejected.*[2]

If a contract does not specifically designate the rights of the employer and the union, it can be legitimately assumed or construed that the contract reserves the normal managerial rights to conduct business operations and to make normal managerial decisions and also gives to the union a voice in managerial decisions that may bring about or result in any arbitrary changes in established working conditions.[3] Also, if the contract contains no limiting clause or is silent relative to scheduling problems and if the contract gives management the right to operate the plant efficiently, arbitrators construe or interpret the contract to allow the employer to arrange his scheduling in a manner to increase efficiency as long as there is no violation of any other aspects of the contract.[4] In fact, the employer is privileged to operate his plant, solve his scheduling problems and direct his working force in any intelligent manner not prohibited by law or the contract.[5] However, if both sides agree to arbitrate an issue this constitutes a complete surrender of the employer's prerogative to determine the issue unilaterally and both the company's and the union's right to use economic power to settle the problem. It is held that arbitration represents a substitution of reason for economic power and unilateral and arbitrary action.[6] *In general, arbitrators are concerned with management's right to increase efficiency and the employee's job rights.*

RIGHT TO ALLOCATE THE WORKING FORCE

If a management's right clause gives to management the exclusive right to manage the plant and direct the working force, then the employer has the power to make changes in the size of the working force or determine the size of the working force, to assign new tasks, and even to eliminate jobs if he does not function discriminatorily or arbitrarily.[7] *Under these contractual conditions the employer is permitted to reduce the size of the crew after machine arrangements so*

that one operator can do the work of two,[8] *eliminate jobs of truck drivers after rearranging routes which made jobs unnecessary, especially if the rerouting is for efficiency purposes,*[9] *and he can discharge employees in order to avoid overlapping even if the contract specifies that discharge can only take place for good cause.*[10] Management is empowered to reduce the work force if the volume of sales is declining[11] and to change work assignment so that the employment of women will be impractical.[12]

Furthermore, if no contract provision is involved, management can discontinue a practice of assigning helpers to skilled craftsmen. Such activity is considered as being within management's discretion.[13] Management, in the assignment of work, can lay off office employees at the same time that it lays off production workers even though work is available for them. This is allowable even if the contract designates the forty-hour week for office workers because this is not a forty-hour guarantee.[14] The employer has the right to determine the time and manner of work to be performed, therefore he can send employees home if one group goes out on strike rather than to rearrange the schedule to provide work for the non-strikers.[15] Management can close the plant or reduce the work week even though the contract provides for a regular work week of forty hours. Such a contract does not guarantee work and unless there is some limitation in the contract or in the bargaining history, management still retains the right to close the plant.[16]

In case the contract gives management the right to relieve persons from work for good reasons, *to determine the manufacturing processes and to make initial determination of wage rates for both new and changed jobs, then management can separate a job into two jobs requiring an unequal amount of skill and establish a lower wage for the less skilled job than was paid on the former job.*[17] *. However, the employer does not have the right to unilaterally combine the duties of two separate classifications unless he is empowered to do so by the contract.*[18] *Also, in the interest of efficiency the employer can transfer work to different departments or from one department to another.*[19]

Where the contract grants the employer the exclusive right to direct the working force, management has the right to improve efficiency[20] *by unilaterally changing job standards*[21] *and by changing job duties.*[22] *The employer may require employees to rotate from one operating unit to another so that they can familiarize themselves with both units,*[23] *or he may require workers to do work of a lower classification in addition to their regular work if the regular work does not take all their time*

if he pays the regular rate for the time spent on the lower rated[24] *jobs.* Furthermore, the employer can assign an employee to another job in addition to his duties on his old job after part of the duties of the old job have been eliminated because of technological advancement.[25] If the contract allows the employer to change job content or create new jobs then he is privileged to combine two jobs.[26] *It is management's prerogative to increase the work load within reason*[27] *or to increase job duties,*[28] to assign painting work to a handy man[29] or to create new jobs.[30] However, the employer cannot assign work to a foreman that is regularly a part of the work of a job covered by the contract[31] or transfer work from one seniority unit to another at his discretion.[32]

Even though it had been a practice of long standing the employer can stop a unilaterally established plan of giving a special payment of one hour extra pay to certain employees. This reasoning was based upon the fact that the plan was established unilaterally by management, that it never had been a subject of collective bargaining, and that the plan discriminated against employees in other plants operated by the employer.[33] However, even if a contract gives the exclusive right to management to direct or assign the working force the union can challenge management's right to assign workers to duties outside of the plant because the contract limits management's exclusive rights to matters concerning the conduct of the plant only.[34]

It has also been established that management has the right to arrange the work schedule because this is necessary to maintain plant efficiency.[35] Management can make unilateral changes on a permanent or a sporadic basis in the work schedule if such changes are necessary to meet conditions beyond the control of management or to meet unexpected and unavoidable conditions.[36] For the sake of efficiency, management is privileged to change the starting time,[37] to change the work schedule from Monday through Friday to Tuesday through Saturday,[38] or to deviate from the standard forty-hour work week, Monday through Friday, and work Saturday and Sunday at premium pay.[39] Furthermore, management has been allowed to install staggered shifts without the union's consent[40] and to change from fixed to rotating shifts if such is essential to meet increased production demands and if such a change would increase job opportunities and premium pay.[41] It comes within the jurisdiction of the employer to discontinue production during a week in which a holiday comes in order to take inventory and to lay off production workers not needed even though such behavior disqualifies the laid off men for holiday pay.[42] However, the employer was barred in one decision from changing from three crew to four crew operation without the consent of the union.[43]

RIGHT TO REQUIRE OVERTIME

In dealing with the employer's right to allocate the working force the problems of requiring the employees to work overtime and of regulating overtime have often arisen. The records show that there has been some disagreement among the arbitrators relative to these problems. For example, arbitrators have ruled that it is management's right to require overtime work if the requirement and the assignment are reasonable and if there is no limitation of hours worked in the contract. Particularly is this right granted to management if the contract fixes eight hours as the normal working day and forty hours as the working week, requires time and one-half pay for work in excess of these hours and if the contract definitely states that workers are to perform work or any duties if such are reasonably assigned. Therefore, it has been held that the company has the prerogative to reasonably direct the employees as to the tasks to be performed and the manner of their performance.[44]

A contract establishing the normal work week as five days of eight hours cannot be interpreted to mean that management cannot require overtime. The word normal implies that abnormal conditions may arise which will require overtime work. However, a clause in the contract requiring reasonable protection to health and safety of the employees may have a limiting effect upon overtime that management may require.[45] Moreover, employees are obligated under reasonable conditions to work overtime or justify their refusal to do so.[46] If an employee refuses to work overtime, management is functioning within its rights when it suspends the worker involved.[47] Also, the allocation of overtime, in the absence of contract clauses or statutes to the contrary, is considered the exclusive right of management.[48] Management has the prerogative to determine the amount of overtime if after making the determination it divides the work among the eligible employees as equally as possible. It has also been held that management has the right to reduce or entirely eliminate overtime by changing the work schedule[49] even though the schedule has been in effect six years if there is no provision in the contract or bargaining history showing that the employer gave up his right to determine work schedules.[50]

On the other hand, some arbitrators have held that in the absence of a contractual clause so designating management cannot require workers to work overtime. Even though the contract clearly recognizes management's right to manage the plant or direct the working force in order to maintain efficient production and time and one-half is paid

for overtime work, the contract does not authorize the employer to require or demand men to work overtime against their will. This reasoning is based upon the idea that it is a hardship for workers to work longer than eight hours per day, and that it is not reasonable, in terms of modern standards, to require them to do so. It is also postulated that the employer is usually able to get sufficient employees to work overtime without resorting to penalties against those who refuse to work longer than the regular shift.[51] The moral obligation to work overtime must be great, that is, an emergency must exist and no one be available to do the job before the employer can demand that employees work overtime.[52] The same reasoning applies to holiday work for holidays are generally considered days of freedom from work.[53]

In the area of overtime work, management's right has been modified or limited in other ways by the arbitrators. It is not proper for management to deny the opportunity for overtime to employees entitled to such extra employment.[54] A contract which permits the employer to schedule any necessary overtime and to excuse employees from such work is not interpreted to permit management to discontinue a three-year practice of excusing an employee from Saturday work for religious reasons.[55] Furthermore, the right of management to schedule work also includes management's duty to do so. Any employer who allows his employees to determine their own overtime may be held responsible for any trouble resulting from the worker-arranged schedule.[56]

RIGHT TO MAKE PRODUCTION CHANGES

Management still retains much power to make various changes in production in order to maximize production and minimize costs. For example, because of outmoded equipment the company is privileged to subcontract work which has been done by members of the bargaining unit even though such a change results in loss of jobs.[57] If there is no contract clause to the contrary, management can eliminate a job and discharge the worker within the bargaining unit and contract the work to an outside contractor if the change is made in good faith.[58] The employer also is privileged to transfer certain work from the bargaining unit employees to engineers if the transfer is for efficient operation of the plant, and if the work is essentially engineering work and is customarily done by engineers. Furthermore, the transfer is legitimate even if it results in the elimination of a leadman's job and the reduction of his status, and the assigning of minor supervisory

duties to a supervisory employee outside of the bargaining unit.[59] On the other hand, the employer has been prevented from transferring work customarily done by employees within the bargaining unit to employees outside of the unit even though there is no contract clause specifically barring the transfer. The effect of such a transfer would be to reduce the area of job opportunities for those in the bargaining unit and to reduce job security which is the basic or primary aim of a collective bargaining contract.[60]

Management has the right to determine what is produced, when it is produced and how it is produced. Therefore, it is management's absolute right to at all times have control over the standards of quality because the lowering of these standards would have serious competitive results.[61] *It has been held that the employer has the power to improve efficiency by using employees full time and by increasing the speed of the machine.*[62]

Some controversy has arisen as to the employer's duty to bargain over technological changes in the area of production. It is the exclusive right and function of management to locate the equipment or determine the plant layout and to adjust work standards. This includes the right to devise new methods and to employ different operating techniques and management has no obligation to the union to guarantee that the new methods will be more practical and efficient than the old methods.[63] *If the contract gives the employer the right to assign jobs, reassign job duties and to determine the methods of production he is empowered to change job methods and eliminate employees,*[64] *to make changes in the incentive standards,*[65] *and to eliminate job classifications if the action is based upon practical necessity.*[66]

Frequently the contract limits the employer's power to change working conditions by requiring that he negotiate with the union before such changes are made. This clause has been interpreted to allow the employer to make technological changes without union permission unless they result in important changes in working conditions.[67] *It has been held that the introduction of labor saving equipment is a change in operating methods rather than a change in working conditions and therefore, no bargaining is necessary before making technological changes. This is true even though the change may result in greater machine speed, eliminate jobs and affect the working habits of various employees.*[68] On the other hand it has been held that management has no right to institute a job evaluation plan without the consent of the union, even though the contract contains no specific prohibition to such action if the contract implies that no major changes can be made in employment conditions without mutual consent. The

inauguration of such a job evaluation plan is considered a major change.[69]

While in the absence of contract provisions to the contrary, management can assign work, determine the methods of production and take reasonable steps to limit liability for workmen's compensation resulting from employment injuries, management must apply any requirement in a non-discriminatory manner. For example, while it is management's right to determine the feasibility of the continuance of operating machines after an inspection for safety purposes and it is management's prerogative to determine whether a request by workers for safety inspection is made in good faith, the employer has no right to disregard the request if such is reasonable and conforms with the safety program functioning in the plant. Also, it is improper for an employer to change job requirements unreasonably by requiring an employee to have a license in order to operate a machine, particularly if it is shown that a license is not needed and that others who operate such machinery have no license.[70]

RIGHT TO DETERMINE RATES OF PAY

The arbitrators have granted to management a great deal of power to determine rates of pay and the method of payment. Management has the right to initially determine the position of an employee within the rate range and to change this position in order to correct demonstrable errors.[71] *The employer is also privileged to set new rates for jobs which are created by reallocating duties from one job to another*[72] *or to adjust standards to compensate for changes in methods of operation if there has been a substantial change in job duties resulting from changes in equipment, method, material or machine speed.*[73] *Management is permitted to change the method of pay or compensation from the hourly rate to the incentive basis if the contract or law does not prevent such behavior.*[74] *The employer is privileged to make unilateral changes in a wage plan if the contract specifies that incentive bonuses are gratuities and not wages and makes no provision for bargaining about bonuses.*[75]

RIGHT TO SELECT AND DISCHARGE

An analysis of the arbitration decisions reveals that management still retains much power to select, demote and to discharge employees. Management has the sole right to hire or select employees, therefore it is legitimate to deny reemployment to an employee who voluntarily

quits his job.[76] It is also a fundamental and basic principle in industries in America that the employer has the exclusive right or power to both select and retain foremen.[77] *It has been considered an inherent right of management to develop techniques and allocate the labor force to maintain efficient production. Therefore, management can demote employees for incompetency or failure to do a job satisfactorily because this action is incidental to the right to operate efficiently.*[78] *In applying this power to demote, management cannot violate contractual relations or state and federal laws.*[79]

It has also been somewhat established in the area of arbitration that if the contract empowers the employer to relieve workers from duty for legitimate reasons if he functions in a non-discriminatory fashion, then the employer has the exclusive right to determine the physical standards and to refuse to keep employees who fail to meet the minimum standards.[80] *If the employer is given the contractual power to fire for just cause, such as inefficiency, then he has the right to determine what constitutes inefficiency but his determination must be substantiated with facts.*[81] In case the contract contains a clause which makes the employer the sole judge of employee qualifications, this does not allow him to discharge an employee for filing suit against the company on the basis that the filing of the suit constituted a moral disqualification.[82]

It is true that even though the contract permits management to discharge for just cause or does not specifically limit such right, management does not have an unrestricted right to sever employment relations. This prerogative would destroy job security which is considered to be the very basis of the collective bargaining contract.[83] An employer cannot discharge discriminatorily; he cannot fail to penalize for similar violations.[84] Management violates its contractual right to discharge for just cause if it discharges temporary employees when work is not available. Management can lay off employees because it is well known that a layoff is due to lack of work while discharge "casts a shadow on the worker's character and reputation."[85]

RIGHT TO MAKE RULES

Under certain definite limitations management is empowered to make rules to maximize efficiency. The company can establish and enforce plant rules as long as they do not violate the contract but the union can object to or protest rules that are contrary to long established past practice.[86] If the contract gives management the right to determine the methods of production and the right to maintain disci-

pline then the employer is not obligated to bargain collectively with the union relative to the formulation of plant safety rules.[87]

All rules formulated by the employer must be in harmony with the contract and must be reasonably consistent and intelligent. No rule can invade the personal rights of the employees to materialize its objective.[88] No rule can be applied discriminatorily, that is, all penalties should be meted out fairly. In the determination of the penalty for rule violation such factors as the conditions under which the rule was violated, the notice given before the rule was enforced, the seniority of the employee involved and the previous warnings given must be taken into account.[89] Plant rules that have become a matter of mutual agreement cannot be changed by the employer without union consent even though the contract gives management a general right to change rules unilaterally.[90]

RIGHT TO DETERMINE RELATIVE SKILLS

In recent years seniority has been a serious issue in the area of industrial relations. In order to safeguard efficient plant operations the employer has insisted upon the ability clause in connection with seniority rights. The ability clause assumes the possibility of wide differences in ability and capacity to perform the required work, and it also poses the question as to the proper authority to judge relative skills and abilities. The argument over the interpretation of such a clause has resulted in numerous cases going before the arbitrators. In general, the arbitrators have held that in the absence of contract clauses providing otherwise, it is management's function to make a determination of relative skills and physical fitness of employees in applying a clause making seniority, ability to do the work and physical fitness as controlling factors in considering promotions and layoffs. This is true because it is management's responsibility to operate the plant efficiently.[91]

Under a contract providing for promotion on the basis of seniority modified by a relative equal ability clause or a qualifying clause management has the right to determine the relative equal ability. Management's decision of the qualifications is ordinarily accepted as final if the decision is based upon legitimate grounds and can be substantiated by relevant evidence.[92] Management can determine the qualifications for promotion in a seniority clause where seniority is given the first consideration in promotion or determine if merit and ability are equal but in so doing the employer must act in good faith, make no errors, and avoid discrimination. The decision can be chal-

lenged if the union feels that good faith is not present.[93] The determination of relative ability should be more broadly construed in case of promotion to supervisory jobs which require more specialized training than in case of promotion from one production job to another.[94]

In the determination of relative equal ability the employer is empowered to use various testing devices. If the contract gives management the right to direct the working force and provides that seniority and ability be considered in making promotions, this implies that the workers must possess the physical ability or the physical fitness to perform the jobs in question. The employer, therefore, has the right to force the employee to take a physical examination after a return from an extended absence or before being transferred to a job requiring greater physical ability. If the doctor's report is unfavorable, the employee is privileged to contest it through the established contractual grievance machinery.[95]

Where the contract specifies that ability to perform the work be considered in making promotions, the employer can require formal examinations to determine ability. In fact, *management is allowed to use any fair method, if the contract does not specify the method, to ascertain an employee's qualifications for promotion. This includes various established tests which can be given either in a written form or orally. These include aptitude tests, merit rating plans and any intelligent new methods of selection.* The only limitations are that the examinations or tests used must be those commonly used and must be fair and reasonable; that the tests or examinations given to determine ability in the area of promotion must be related to the skill or knowledge required for the job, and that *the tests must be used in a nondiscriminatory manner;* they are not to be used as hurdles but as verifying techniques and cannot materially prejudice the employee's right to promotion.[96]

Consequently management cannot determine ability for promotion by a casual interview.[97] The employer is required to make a more thorough investigation of employee qualifications than could be obtained from such an interview. Also, if a contract specifies observance of seniority in promotions and demotions when ability is relatively equal and if the contract allows management's determination of ability to be controlling if it is fair and equitable, the employer cannot make a reduction in the working force by using a blanket rule stating that all employees who lack extended training or experience on a certain job can be demoted. Ability must be interpreted to include the general ability of each individual worker involved.[98] Neither can intermittent

absences because of illness be considered an adequate reason for failure to promote an eligible employee.[99]

Where seniority and competency are the chief factors governing promotions, the proof of lack of competency is the responsibility of management. The fact that another employee is more competent than a senior employee is not relevant if the senior employee possesses the qualifications for the advanced job.[100] No senior employee eligible for promotion can be passed by in favor of a junior employee on the basis of relative youth and absenteeism if ability and skill are the sole determining factors incorporated in the contract.[101] If the contract provides that promotions be made on the basis of seniority and other qualifications the employer cannot promote an employee who has superior qualifications in preference to a qualified employee who has more seniority. This practice would give little consideration to seniority.[102]

Under contract provisions providing that in case of plant-wide layoffs senior employees shall be retained in so far as practical and consistent with ability to do the work and that the determination of ability and practicality will be made by the employer subject to the grievance procedure the employer's judgment, if based upon reason and if fair, must be accepted.[103] In fact, if the contract provides that seniority shall be controlling in layoffs wherever physical fitness and ability are equal the employer's determination of these qualities may be reviewed by the arbitrator only to see whether or not the employer exceeded his contractual jurisdiction. The arbitrator cannot substitute his judgment for that of management.[104] Also, if the contract allows for exemptions from seniority of a limited number of employees of unusual or special ability or talent in case of layoffs management has the right to make the initial determination of unusual ability.[105]

Furthermore, in determining ability in case of layoffs management may use any fair way or method to test ability and physical fitness. Employees cannot refuse to take the required examinations. Management can determine ability and skill for layoffs on the basis of a unilaterally arranged merit rating plan if the plan is properly related to the measurement of ability and skill and if the factors employed are rated correctly.[106] However, *the employer is not privileged to determine ability on the basis of a merit rating plan which includes such factors as cooperation, attendance records, personal habits, and safety habits. Ability to perform work differs from ability or willingness to live up to plant rules.*[107]

While the employer is granted the right to make the initial determination of relative ability and physical fitness in case of layoffs the

union may question the decision and challenge such determination.[108] The union has the right to take the matter up through the grievance procedure and arbitration to discover whether management acted arbitrarily or in a capricious manner thereby abusing its right.[109] In case the union challenges management's determination, management may be required to support the charge[110] or the union may have the burden of proving that management abused its right by discriminating or acting in bad faith. *The employer's decision is controlling unless the union can refute it.*[111]

It has been generally held by the arbitrators that unless limited specifically by the contract, management is the sole judge of ability or qualifications to perform available work.[112] *Therefore management is justified in its position that an employee must be able to perform the incidental duties connected with the job.*[113] *Management is responsible for the operation of the business and therefore can fix reasonable qualifications for vacant positions,*[114] *unilaterally change qualifications for a particular job,*[115] *increase minimum qualifications to fill a job,*[116] *and use any reasonable method to test ability.*[117]

The owner of the plant has a superior right to operate his own equipment even if by so doing another employee is laid off in the absence of a contract clause forbidding such behavior.[118] The employer has the right to even perform journeymen's work in his own business if the contract does not limit him. It is recognized that an employer has the inherent right under law to work for himself or others as he sees fit and has the right to control his own property in the absence of limitations imposed by law or contract.[119]

LIMITATIONS ON MANAGEMENT RIGHTS

In dealing with all these rights of management, it should be recognized that various limitations may be imposed as to management's functioning in this framework. Even where clauses are incorporated in the contract giving management the right to manage, the question whether management exercised its rights under such a clause fairly and non-discriminatorily is an arbitrable issue.[120] Also, a right which management may exercise free from union control may be nullified if it is used to violate any other provision of the contract or any law.[121] In fact, management has no legal or moral right to punish an employee for refusing to obey any orders which are in violation of the contract.[122]

Furthermore, arbitrators have held that management has certain definite responsibilities and obligations to fulfill. Management must pay employees at specified times or suffer a penalty,[123] must pay part

of the money damage awarded to an employee who was assaulted by a fellow employee because the superintendent should have stopped the fight,[124] must avoid exposing employees to unnecessary hazards to health and safety,[125] *and must point out errors and assist employees to improve their efficiency.*[126] Management is responsible for informing foremen as to their duties, authorities and rights in enforcing plant rules.[127] Because management is responsible for making the plant accessible to its employees it cannot dock an employee's pay for reporting late to work because the railroad crossing was blocked and this was the only entrance to the plant.[128] *Management is also obligated to negotiate with a union on grievances resulting from work changes due to technological introductions in the plant even though the contract grants the employer the right to run his own business and to introduce time saving devices.*[129]

In conclusion, it might be stated that arbitrators have been called upon to render numerous decisions dealing with managerial rights or prerogatives. While there are some variations in the reasoning emerging from the decisions, in general the arbitrators are concerned with the right of the employers to maintain job efficiency and the right of the workers to their jobs and to some form of job security. *This analysis clearly reveals that while some modifications have been made in relation to management's right to manage, the employer still retains the powers to operate intelligently and efficiently. It is assumed by the arbitrators that management has certain original rights, authority or power to manage or conduct the business and that these are modified only to the extent that management voluntarily or specifically relinquishes them in terms of a collective bargaining agreement.* While management has certain exclusive powers to manage, these rights must be exercised fairly. In other words, management cannot function in these defined areas in a discriminatory or arbitrary manner. *The union is empowered to question or challenge managerial decisions and to take the matters up through the process of arbitration to determine whether or not management abused its right.*

Footnotes

1. Campbell, Wyant and Cannon Foundry Co. 1 LA 254 (1945) Goodyear Tire and Rubber Co. 1 LA 556 (1946)
2. Illinois Bell Telephone Co. 15 LA 274 (1950)
3. Novelty Shawl Co., Inc. 4 LA 655 (1946)
4. Pittsburgh Tube Co. 9 LA 834 (1948)
5. Ingram-Richardson Mfg. Co. of Indiana, Inc. 3 LA 482 (1946)

6. Pan American Airways, Inc. 5 LA 590 (1946)
7. American Zinc and Chemical Co. 6 LA 314 (1946)
8. Bethlehem Pacific Coast Steel Corp. 18 LA 612 (1952)
9. Mason and Dixon Lines, Inc. 18 LA 616 (1952)
10. New York Tribune, Inc. 8 LA 410 (1947)
American Rolling Mill Co. 9 LA 410 (1948)
11. Hersh's, Inc. 14 LA 280 (1950)
12. General Cable Corp. 7 LA 691 (1947)
13. American Zinc Co. of Ill. 18 LA 827 (1952)
14. General Cable Corp. 17 LA 780 (1952)
15. Bethlehem-Sparrows Point Shipyards, Inc. 19 LA 523 (1952)
16. American Agricultural Chemical Co. 18 LA 625 (1952)
17. International Shoe Co. 10 LA 432 (1948)
18. Esso Standard Oil Co. 19 LA 569 (1952)
19. Standard-Coosa-Thatcher Co. 19 LA 148 (1952)
Robertshaw-Fulton Controls Co. 20 LA 64 (1952)
20. U.S. Coal and Coke Co. 2 LA 60 (1944)
21. Armour and Co. 8 LA 1 (1947)
22. Diemolding Corp. 2 LA 274 (1945)
23. Mathieson Chemical Corp. 18 LA 620 (1952)
24. Campbell Soup Co. 17 LA 800 (1951)
25. General Baking Co. 14 LA 83 (1950)
26. Metal and Thermit Corp., Inc. 1 LA 417 (1946)
27. Gordon Baking Co. 3 LA 87 (1946)
28. Ashland Oil and Refining Co. 6 LA 774 (1947)
29. Bethlehem Steel Co. 19 LA 577 (1952)
30. Irvington Varnish and Insulator Co. 8 LA 1041 (1942)
31. Kraft Foods Corp. 10 LA 254 (1948)
32. Lukens Steel Co. 15 LA 408 (1950)
33. New York Trap Rock Corp. 19 LA 421 (1952)
34. Schick, Inc. 2 LA 552 (1945)
35. Columbia Steel Co. 7 LA 881 (1947)
36. Inland Steel Co. 16 LA 277 (1950)
Gibson Refrigerator Co. 17 LA 313 (1951)
37. Western Automatic Machine Screw Co. 12 LA 38 (1949)
38. National Tube Co. 16 LA 517 (1951)
39. General Cable Co. 15 LA 343 (1950)
40. Sinclair Refining Co. 15 LA 142 (1950)
International Minerals and Chemical Corp. 13 LA 192 (1949)
41. General Cable Corp. 15 LA 910 (1950)
42. Vincent McCall Co. 16 LA 328 (1951)
43. Minnesota Mining and Mfg. Co. 15 LA 46 (1950)
44. Flour Mills of America, Inc. 20 LA 564 (1952)
Great Lakes Spring Corp. 12 LA 779 (1949)
Nebraska Consolidated Mills Co. 13 LA 211 (1949)
45. Carnegie-Illinois Steel Corp. 7 LA 643 (1945)
46. National Folding Box Co. 13 LA 269 (1949)
47. Deere and Co. 11 LA 561 (1948)
48. Graham Bros., Inc. 16 LA 83 (1951)
Ingersoll-Rand Co. 7 LA 564 (1947)

49. Midtown Realty Owners Association, Inc. 7 LA 307 (1947)
National Tube Co. 16 LA 517 (1951)
F. W. Woolworth Co. 4 LA 502 (1946)
50. United States Potters Association 19 LA 213 (1952)
51. A. D. Juilliard and Co., Inc. 17 LA 606 (1951)
52. National Electric Coil Co. 1 LA 468 (1945)
53. Firestone Tire and Rubber Co. 20 LA 880 (1953)
54. U.S. Rubber Co. 13 LA 839 (1949)
55. International Shoe Co. 2 LA 201 (1946)
56. Fulton Glass Co. 10 LA 75 (1948)
57. Librascope, Inc. 19 LA 219 (1952)
58. Appalachian Electric Cooperative 19 LA 815 (1953)
59. Emerson Electric Mfg. Co. 19 LA 264 (1952)
60. New Britain Machine Co. 8 LA 720 (1947)
61. Torrington Co. 1 LA 20 (1945)
62. Thor Corp. 16 LA 770 (1951)
63. Corn Products Refining Co. 18 LA 346 (1952)
64. St. Louis Car Co. 5 LA 572 (1946)
65. A. C. Lawrence Leather Co. 6 LA 465 (1946)
66. Trailmobile Co. 8 LA 560 (1947)
67. Goodyear Tire and Rubber Co. 1 LA 556 (1946)
68. Goodyear Tire and Rubber Co. of Alabama 6 LA 681 (1947)
69. General Aniline and Film Corp. 19 LA 628 (1952)
70. Monmouth Consolidated Water Co. 18 LA 887 (1952)
71. International Harvester Co. 18 LA 353 (1952)
72. Mengel Co., Inc. 17 LA 361 (1951)
73. Maytag Co. 18 LA 164 (1952)
74. Blackhawk Mfg. Co. 7 LA 943 (1947)
National Lock Co. 15 LA 945 (1951)
75. General Controls Co. 10 LA 341 (1948)
76. Hart-Carter Co. 2 LA 292 (1945)
77. King Powder Co. 1 LA 215 (1944)
78. E. I. DuPont de Nemours and Co. 7 LA 580 (1951)
79. WLEU Broadcasting Co. 7 LA 150 (1947)
80. Carnegie-Illinois Steel Corp. 7 LA 643 (1945)
Timm Industries, Inc. 11 LA 308 (1948)
81. Gaylord Container Corp. 10 LA 439 (1948)
82. Eagle-Picher Mining and Smelting Co. 8 LA 108 (1947)
83. Atwater Mfg. Co. 13 LA 747 (1949)
84. Aluminum Co. of America 8 LA 234 (1945)
85. American Republics Corp. 18 LA 248 (1952)
86. John Morrell and Co. 9 LA 931 (1948)
Standard Oil Co. (Indiana) 11 LA 689 (1948)
87. International Harvester Co. 12 LA 73 (1949)
88. Campbell Soup Co. 2 LA 27 (1946)
89. Baltic Metal Products Co. 8 LA 782 (1947)
Alan Wood Steel Co. 3 LA 557 (1946)
90. Ampco Metal, Inc. 3 LA 374 (1946)
91. Republic Steel Corp. 1 LA 244 (1945)

92. Seeger Refrigerator Co. 16 LA 525 (1951)
Mutual Telephone Co. 19 LA 270 (1952)
Quincy Market Cold Storage and Warehouse Co. 7 LA 58 (1947)
93. Hercules Powder Co. 10 LA 624 (1948)
Luckenbach Steamship Co., Inc. 6 LA 98 (1946)
94. Butler Bros. 9 LA 458 (1948)
95. Doehler-Jarvis Corp. 12 LA 896 (1949)
96. Youngstown Sheet and Tube Co. 18 LA 413 (1952)
Acme Steel Co. 9 LA 432 (1947)
American Can Co. 10 LA 613 (1948)
Columbia Steel Co. 15 LA 840 (1950)
97. Southern California Edison Co. 15 LA 162 (1950)
98. Ford Motor Co. 7 LA 74 (1947)
99. Indiana Bell Telephone Co. 9 LA 444 (1948)
100. Pittsburgh Plate Glass Co. 8 LA 317 (1947)
101. Central Screw Co. 11 LA 108 (1948)
102. International Harvester Co. 11 LA 1190 (1948)
103. Fruehauf Trailer Co. 10 LA 423 (1948)
George B. Matthews and Sons, Inc. 3 LA 313 (1946)
104. Borg-Warner Corp. 13 LA 149 (1949)
105. Allen-Bradley 13 LA 449 (1949)
106. Merrill Stevens Dry Dock and Repair Co. 17 LA 516 (1951)
107. Western Automatic Machine Screw Co. 9 LA 606 (1948)
108. Inland Steel Co. 2 LA 655 (1945)
Crown Cotton Mills 7 LA 526 (1947)
109. American Air Filter Co., Inc. 6 LA 786 (1947)
Mutual Telephone Co. 19 LA 270 (1952)
110. Bethlehem Steel Co. 5 LA 578 (1946)
111. Combustion Engineering Co. 9 LA 515 (1948)
112. Ingram-Richardson Mfg. Co. of Indiana 3 LA 482 (1946)
113. Dodge Cork Co., Inc. 8 LA 250 (1947)
114. Twin Coach Co. 1 LA 59 (1944)
115. Pennsylvania Salt Mfg. Co. 14 LA 12 (1949)
116. Lawrence Products Co. 14 LA 310 (1950)
117. Stauffer Chemical Co., Inc. 8 LA 278 (1947)
118. Reliable Machine Screw Co. 8 LA 791 (1947)
119. Williams Film Laboratories 2 LA 506 (1946)
120. McInerney Spring and Wire Co. 9 LA 91 (1947)
121. Modernage Furniture Corp. 12 LA 680 (1949)
122. Dwight Mfg. Co. 12 LA 990 (1949)
123. Full-Fashioned Hosiery Mfgs. 2 LA 463 (1943)
124. Profile Cotton Mills 2 LA 537 (1942)
125. International Shoe Co. 14 LA 253 (1950)
126. Master Electric Co. 5 LA 339 (1946)
127. Standard Oil Co. (Indiana) 11 LA 689 (1948)
128. Ekco Products Co. 17 LA 433 (1951)
129. Emge Packing Co. 15 LA 603 (1948)

APPENDIX B

Frequency Curves and Productivity

by Maurice D. Kilbridge, Ph.D.

GENERAL THEORY

A frequency curve is one for which at any point on the abscissa the height of the curve is proportional to the frequency at that point, and the area under it between any two limits is proportional to the frequency of occurence within those limits. Such frequency curves may take on an infinite variety of shapes, and mathematical statisticians have developed equations that exactly define many common types. The most useful of these is the normal curve, sometimes called the normal probability curve or the bell-shaped distribution. Its familiar shape is illustrated in Figure 19(*a*). Although most of the area under it is included within the limits of $\bar{x} \pm 3\sigma$, the curve extends from $-\infty$ to $+\infty$.

The most useful limits in the analysis of normal distribution curves are:

Limits	Per Cent of Total Area Within Specified Limits
$\bar{x} \pm 0.6745\sigma$	50.00
$\bar{x} \pm \sigma$	68.26
$\bar{x} \pm 2\sigma$	95.46
$\bar{x} \pm 3\sigma$	99.73

TAKEN FROM THE MANAGEMENT OF WAGE INCENTIVES, UNPUBLISHED MANUSCRIPT, 1954, PP. 192–215. USED BY PERMISSION OF THE AUTHOR.

This means that for those distributions which approximate the normal curve, about two-thirds of the occurrences fall within one standard deviation on either side of the average, all but five per cent fall within two standard deviations, and practically all fall within three standard deviations. There are two measures which completely define the normal frequency curve, its dispersion and its central measure. Dispersion is usually measured in terms of σ, the standard deviation, and central measure as the arithmetic mean.

However, the normal frequency curve does not adequately describe most situations of worker productivity. Such curves are usually found to be skewed either to the right or the left as shown in Figure 19(b) and 19(c).

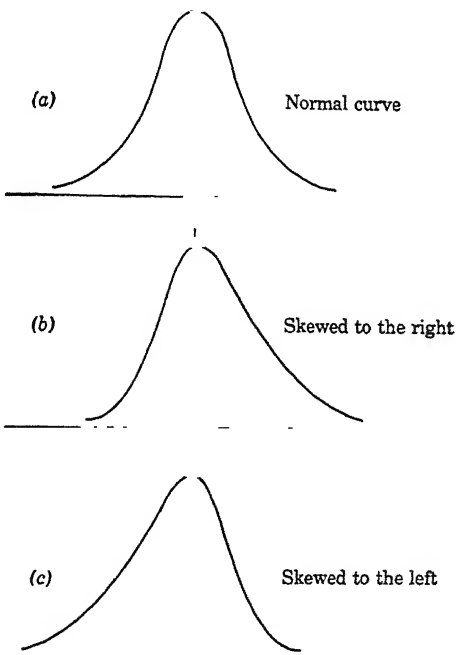

Figure 19. Normal and Skewed Frequency Distributions.

To describe such a curve three measures are necessary: the standard deviation, σ, the arithmetic mean, M, and an absolute measure of skewness or shape. First, we shall analyze the shape of the frequency distribution of worker productivity under incentive conditions.

Shape of Frequency Curves of Productivity. Many writers have asserted that the frequency curve of productivity under an incentive

system should be positively skewed. Even if workers are employed by random selection from the populace, it is generally thought that subsequent changes in the composition of the work force tend to skew the distribution to the right. There is unquestionably a process of natural, and sometimes forced, selection operating to increase the average productivity of a work group. The fact that management may use pre-employment selection tests does not materially change the situation. The best test of ability to perform is actual on-the-job performance, and no employment test devised can predict this with . . . accuracy.

This process of progressive selection is a sort of industrial "survival of the fittest." Those operators not able to perform at the required level either leave or transfer to other work of their own volition, or management initiates such action. They are then replaced by workers representing an average cross-section of ability and the weakest among these in turn leave. Meanwhile, the better operators in the group are not prone to change employment. They are earning incentive pay which may augment their base pay by 40 or 50 per cent and there is no certainty that they can do as well on other work. What is more, in all likelihood they represent a group of workers psychologically suited to the work. Generally we like what we can do well and dislike what is difficult for us. As this process of adjustment continues the composition of the work group approaches stability at a level of average performance considerably above that of the original group. The result is a frequency curve of productivity distinctly skewed to the right showing a high percentage of skilled workers. A typical frequency curve of an effectively motivated group of incentive workers is shown in Figure 20(*b*).

Admittedly this discussion has been only intuitive. It is based on what experience has shown to be the case and draws upon common sense and judgment. There is no fund of quantitative information available on this subject. Very few experiments have been conducted, and no general mathematics-deductive theory has been derived to cover the situation. With some effort this could be done. As an operations research project it would be ideal.

In addition to the tendency of incentives to skew the productivity curve to the right (when they are effectively operating) as shown in Figure 20(*b*), [it is supposed that]* certain undesirable conditions can also be detected by observing the shape of the curve. Assume company policy requires the setting of production standards so that the average worker can earn thirty per cent above base pay. If the standard is tight, a larger than normal percentage of the operators will [be

expected to]* perform beneath standard and the average performance of the group will not reach the 130 per cent incentive opportunity which the standard is supposed to represent. A typical curve showing the effect of a tight standard on the frequency distribution is shown in

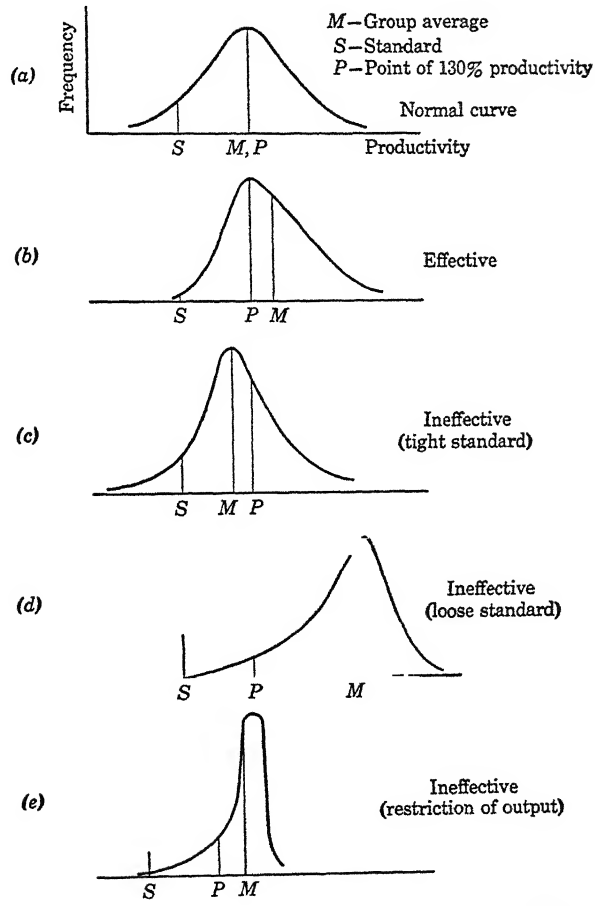

Figure 20. Frequency Curves Indicating Effectiveness of Incentive Plans.

Figure 20(*c*). On the other hand, if the standard is loose the group will [be expected to]* average far above the 130 per cent incentive opportunity, and practically no operator will fail to meet standard. See Figure 20(*d*). In this situation the incentive system is ineffective in that, although it may increase production, it does not minimize unit

* Qualifying phrases in brackets are ours.

costs. Management is paying more per unit of production than it should.

Group restriction of output is also apparent from the shape of the frequency curve.... Suffice it to point out here that a sudden dropping off of production as shown in Figure 20(*e*) indicates a concerted withdrawal of effort at an agreed point. The group in this case is restricting its output for a definite reason, usually so as not to call attention to a loose standard.

RANGE OF PRODUCTIVE CAPACITY AMONG INCENTIVE WORKERS. Having established, albeit rather flimsily, the shape of the frequency curve of productivity we must next describe its central measure and dispersion.

The central measure of productivity most commonly used is the simple arithmetic mean, or average of the group. This value when compared to the average incentive opportunity gives a critical measure. If it is the company's policy to set production standards so that the average worker can earn 30 per cent incentive pay, the actual average incentive earnings when compared to this figure indicate partially the effectiveness of the incentive. In Figure 20 these two points, the point of 130 per cent productivity and the group average, are labeled as *P* and *M* respectively. The importance of the relationship between these points will be more apparent after our discussion of the range of productivity.

The dispersion of the frequency curve is, of course, the measure of the range of operator productivity under an incentive plan....

It is interesting to note that the ranges of production run from 1.40:1 to 5.00:1 with a median of 2.15:1, while the ranges of motor capacities run from 1.65:1 to 3.43:1 with a median of 2.18:1. This greater range of productive operations can be attributed largely to circumstances surrounding the job, since the motor capacities were tested under laboratory conditions, but the productivity figures came from uncontrolled industrial situations.

It must also be pointed out that these ratios represent extreme variations. For moderate sized groups an average range ratio of about 1.4:1 is a much more reasonable figure....

The range of productive capacities is of importance in interpreting the dispersion of a frequency curve. What is important is the relationship between this range and the type of work involved. It stands to reason that the range of productivity will be greater on those jobs which are largely manual and allow for the development of special skills than on work which is machine controlled or paced or where the skill requirement is negligible. Different classes of industrial

work can easily be postulated for purpose of discussion, although there is no information available on the range of productivity by such classes. The following is a classification of industrial operations which might very well have range ratio running from 1.30:1 to 4.00:1.

1. Machine controlled operation. This includes all operations in which the machine time occupies 90 per cent or more of the total cycle and the operator time, or "down time," occupies less than 10 per cent.

2. Mostly machine time operation. This includes all operations in which the machine time occupies 50–89 per cent of the total cycle and the operator time, or "down time," occupies less than 50 per cent.

3. Mostly "down time" operation. This includes all operations in which the machine time occupies only 10–49 per cent of the total cycle and the operator time, or "down time," occupies 50 per cent or more.

4. Operator controlled operation. This includes all operations in which the machine time, if any, occupies less than 10 per cent of the total cycle and the operator time occupies 89 per cent or more.

5. Skill controlled operation. This includes all operations in which the effort of the operator is strictly secondary to skill and knowledge, and machine time does not play any significant part of the complete cycle time.

6. Material controlled operation. This includes all operations in which the material involved becomes the principal factor controlling the operation cycle due to its inherent quality.

This list is presented primarily to suggest how productivity ranges can be influenced by the type of work. It is an arbitrary selection and no extensive use will be made of it.

To illustrate the importance of knowing the natural productivity range of the job when interpreting the dispersion of the frequency curve, consider the following hypothetical case. Assume an operation of class 3, "mostly down time operation," has a natural operator productivity range of 2:1, and an operation of class 5, "skill controlled operation," has a natural operator productivity range of 3:1. If the production standard is set at 100 per cent and 130 per cent is intended to be the average incentive opportunity, the least productive operator on the class 3 operation with a range of 2:1 will perform at 87 per cent of standard, while the most productive operator will perform at 173 per cent standard. With the same sort of standard on the class 5 job with a range of 3:1, the least productive operator performs at 65 per cent of standard and the most productive at 195 per cent. These figures

are based on the assumption of a normal distribution, and the least and most productive operators were taken at -3σ and $+3\sigma$, respectively.

In the case of our second job we could expect about 18 per cent of the operators to exceed 150 per cent of standard, but only about 3 per cent should exceed 150 per cent of standard on the first job, and if a greater number exceeds 150 per cent we should suspect an incorrect standard.

When the dispersion of the frequency curve of productivity is interpreted without considering this variable, the results may be meaningless. Yet we have no knowledge at this time of the inherent variability in operator productivity ranges on different kinds of work. That is, we have no way of determining or eliminating this variable. . . .

In concluding this section on theory it must be pointed out that these unresolved problems regarding the shape and dispersion of the frequency distribution curve need not prevent its use in practical situations, although they ought to militate against an unreserved acceptance of curve analysis as a tool for evaluating incentive installations. In the next section an attempt will be made to apply production frequency curves to measure the effectiveness of an incentive system in one particular company.

Frequency Curves in a Manufacturing Company

This case study is an extensive analysis of the effectiveness of the incentive system in a large plant in the Chicago area producing heavy capital equipment for the mining industry. Not only is it an example of the use of frequency curves, but it also illustrates the last stages of decay of an incentive system suffering from a long period of mismanagement. The organization employs about 800 shop workers on a wide variety of machining and fabricating operations, only 300 of whom are covered by the incentive plan.

HISTORY OF THE INCENTIVE PLAN

A Bedaux wage incentive plan was installed in 1939. This plan possessed all the features typical of Bedaux installations of that time. The worker's production was counted in terms of so many units, or B's, of work. Each operation to be performed had its own incentive base rate determined by the tolerances to be held, quality of the finish to be produced, or other evidence of skill requirements. There was no association between the incentive base rate of the work and the

personal base rate of the employee. The latter was set rather arbitrarily and was subject to increases through merit rating. In 1941 a formal job evaluation program based on that of the National Metal Trades was introduced. This replaced the old personal base rates of the employees but did not influence the incentive base rate of work. In 1945, and several times since then, general plant-wide wage increases were granted. These increases were added to the personal base rates only and did not affect the incentive base rates which continued at their pre-war level. The result was a widening gap between the worker's personal rate and the rate used to calculate his incentive earnings. In several cases observed this gap amounted to 66 cents an hour. This served to reduce materially the true incentive opportunity. Although the standard provided an opportunity for, let us say, a 30 per cent above standard response, it did not provide for 30 per cent incentive earnings. For example:

A. Personal rate of employee (welder)	$1.50 per hour
B. Incentive base rate of job	1.00 per hour
C. Actual hours on job	8 hours
D. Earned hours produced	10.4 hours
E. Per cent performance, D/C	130 per cent

Earnings = 10.4 hours $1.00 per hour	= $10.40
plus 8 hours @ A–B, $.50 per hour	= 4.00
Total earnings	$14.40
Guaranteed 8 hours @ $1.50	$12.00

Per cent earnings above base $14.40/$12.00 = 120 per cent

Thus, although the worker produced all day at 130 per cent of standard, he was paid only 120 per cent of his base rate.

To offset this widening gap between incentive base rates and personal base rates and to maintain the originally intended incentive opportunity in the interest of assuring attractive take-home pay, the time study department decided upon the unfortunate maneuver of proportionally loosening the production standards. From that time on the incentive system suffered an accelerated process of decay, culminating in almost complete disintegration. At the time this study was made the company's management had decided that something must be done about the situation and had hired a first-rate industrial engineer to oversee the work of revising the entire method of wage payment. In the frequency curves that follow, the degenerate state of things is clearly evident.

GATHERING THE DATA

The data were gathered over a period of one month in 1952. Most incentive workers in the plant are included, making a total of 2,150 working days. The daily average performance of each operator was computed and summarized into a grouped frequency distribution. This was done for each department for each week and the total month and also for the entire plant for each week and the total month.

Following is a description of the departments that were on incentive and were used in this analysis:

Department No. 100:	Turret lathes.
Department No. 200:	Engine lathes.
Department No. 300:	Milling machines, surface grinders, and radial drill presses.
Department No. 400:	Very large tools (e.g., vertical and horizontal boring mills, radial drills, crankshaft grinders, etc.).
Department No. 1000:	Welding operations.
Department No. 1100:	Bench burring operations.

From the grouped frequency distribution, smooth frequency curves were plotted for individual departments and the entire plant on a weekly and monthly basis. Only some of these curves are shown here. They are typical of all the curves drawn.

Interpreting the Frequency Curves. Figure 21 is typical of the weekly departmental performances of the six incentive departments. With the exception of Department 200, Engine Lathe, the curves are quite similar. They are either bi-modal or show hints of tending to be tri-modal. There is only a slight variation in the place of the two peak performances. The first mode varies from 75 to 92 per cent and the second, larger, mode varies from 145 to 160 per cent, with the average at 158 per cent of standard. This point of 158 per cent performance is indicated on the drawings because it is a critical figure. Beyond it production drops off precipitously, indicating definite restriction of output.

No reason for the peculiar shape of the curve in Department 200 could be found. Try as we could, no really convincing explanation could be worked out. It is not a small department, having 161 incentive workdays in the week shown. Twenty-nine of these days were worked at only 75 per cent of standard. There is no apparent peculiarity in the composition of the work force. Standards are mostly

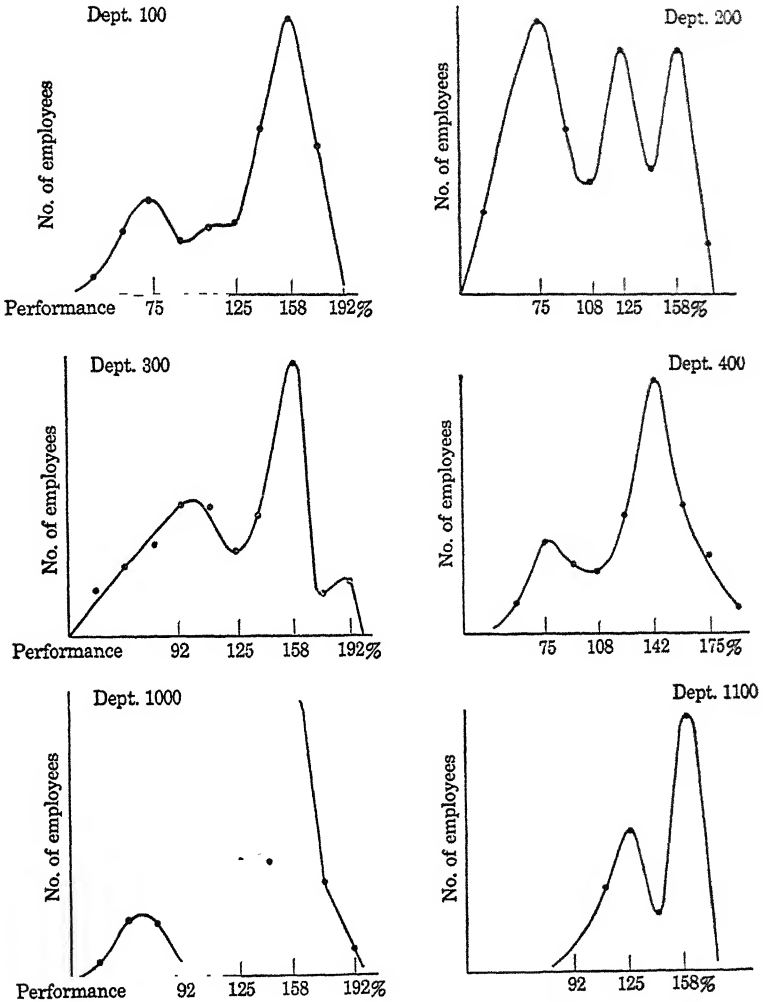

Figure 21. Weekly Departmental Performance.

loose, just as in every other department. Nor is the company's management able to explain this singular anomaly. The suspicion is that supervision is responsible. For some reason the employees seem to be striking back at the company by withholding production.

Figure 22 shows the six incentive departments grouped into total plant performance by the week. Note the great similarity from week to week indicating a stable pattern of performance. In the total picture Department 200 does not greatly influence the first mode of

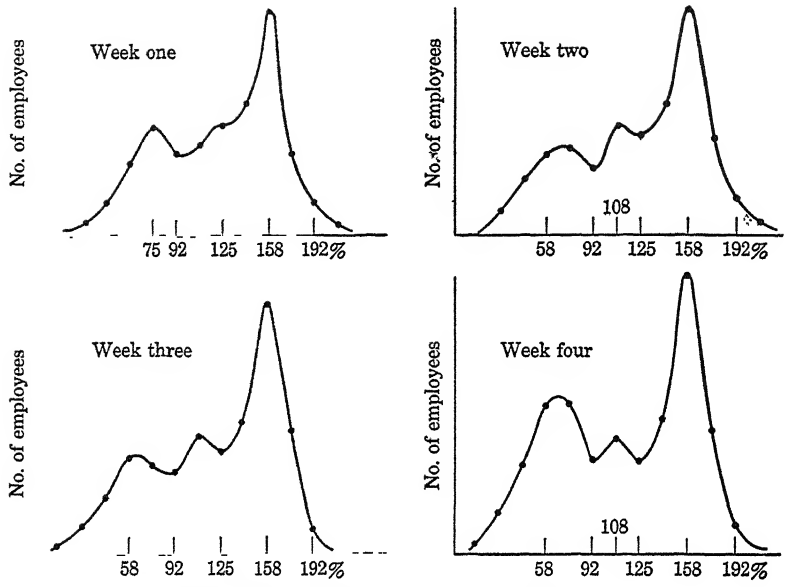

Figure 22. Weekly Plant Performance.

production, although it contributes to the more definite tri-modal nature of the curve.

When these four weekly plant curves are combined to give the curve of monthly plant performance (Figure 23) we still have a curve very much like the original weekly department curves. This further illustrates the stability of the data gathered and justifies rather positive inferences from this curve. Note that it consists of normal distribution ranging from 10 to 110 per cent performance, a curve skewed to the left starting at 110 per cent performance, increasing steeply to about 160 per cent and then suddenly dropping off to almost nothing, and an additional peculiar little hump at about 110 per cent performance.

A careful analysis of these curves in conjunction with a rather intimate knowledge of operating conditions in the company and the history of its wage incentive system seems to warrant the following general conclusions:

1. Loose standards abound. This is easily seen by observing that the majority of the workers average well over the normal incentive expectancy. If the standards were reasonable, these curves would peak at about 130 per cent rather than 160 per cent.

2. Output is being systematically restricted. This is apparent from the precipitous dropping off of the frequency curves after 160 per cent

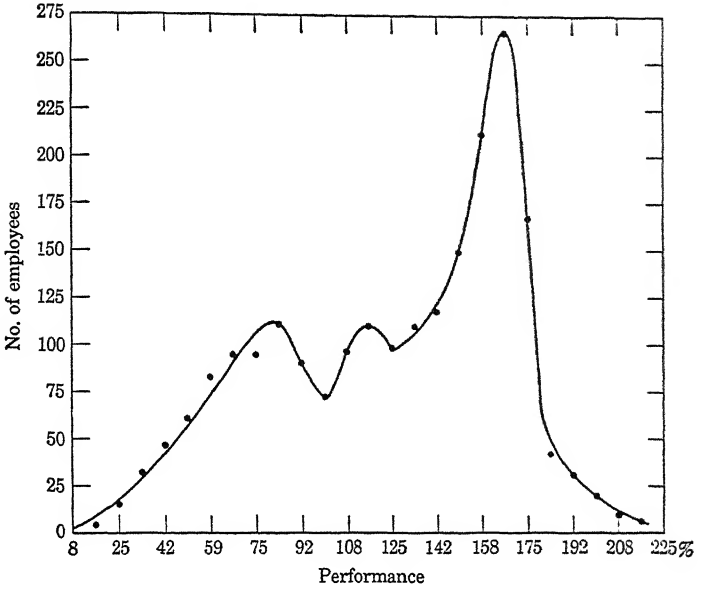

Figure 23. Monthly Plant Performance.

performance. A company policy, since changed, once required an investigation and retiming of jobs when production hit 160 per cent. The evils deriving from this practice cannot be overemphasized.

3. There is an abnormally large group of operators who are not responding to the incentive of extra pay for extra effort. Considering that the standards are generally loose, that group of operators averaging about 75 per cent of performance is simply not making a fair effort. They would rather produce below standard knowing that their base rate is guaranteed than make the required effort to earn incentive pay. This indicates poor supervision. In Chapter II [of this dissertation] it was emphasized that financial incentives alone cannot be relied upon. In the final analysis it is up to the supervisor to get the production out. Also, to some degree, this group of non-bonus earners can be credited to the unusually tight labor market in the area. Many marginal workers are being retained who in normal situations would be released. This group also contains a few learners, but they are a small percentage of the whole.

4. The peculiar little hump at about 110 per cent performance represents a group of employees who desire to attain standard production so as to receive their merit rating increase in personal base rate. To receive a merit increase workers must perform at standard or above

for three weeks. This is not a stable group consisting of the same employees all the time. It is an always changing group of workers who actually are permanent members of the group just described who do not care to earn bonus. Periodically, when it is time for their merit rating increase to be processed, they spurt ahead and produce at or near standard for a while. After their increase is assured they drop back to their former low level of performance. If it were not for this merit rating factor, the frequency curves would be bi-modal rather than tri-modal.

This case illustrates a rather obvious situation in which the interpretation of the frequency curves is facilitated by pronounced deficiencies in the incentive system. When matters are this far gone there is little to be gained by attempting precise measurements of skewness or dispersion, or attempting to correlate dispersion with the inherent productivity ranges of the work. No case is available to the writer at this time in which such measures can be determined. However, this particular case does provide a variety of interesting situations and serves to illustrate the use of frequency curves better than a more normal situation would.

In concluding this discussion of the use of frequency curves of productivity in measuring the effectiveness of wage incentives the point must be made that, although the theory presented here was based on the assumption that frequencies were plotted for operators performing the same operation, there is no reason why such curves cannot be used, at least qualitatively, for plotting the performance of entire departments, or over-all plant. This was, in fact, done in the case presented here and proved of some value.

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Index